DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
INTEGRATED PRODUCT TEAM WEST
2001 JUNIPERO SERRA BOULEVARD, SUITE 600
DALY CITY, CALIFORNIA 94014-1976

IN REPLY REFER TO:

Ser 05/381
March 14, 2005

Mr. Phillip A. Ramsey
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, CA 94105

Re: DRAFT FINAL DATA GAPS SAMPLING AND ANALYLSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) TIDAL AREA SITES 2, 9, AND 11, NAVAL WEAPONS STATION SEAL BEACH, DETACHMENT CONCORD, CONCORD, CALIFORNIA

Dear Mr. Ramsey,

In accordance with Sections 10.2 (a), 10.3 (c), and 10.7 (e) of the Federal Facility Agreement (FFA), enclosed please find for your review and consideration for acceptance the "Draft Final Data Gaps Sampling and Analysis Plan (Field Sampling Plan / Quality Assurance Project Plan) Tidal Area Sites 2, 9, and 11, Naval Weapons Station Seal Beach, Detachment Concord" dated March 14, 2005 (draft final SAP). This draft final SAP is a primary document and as specified in Sections 10.9 and 22 of the FFA, this document will serve as the final document if the U.S. Environmental Protection Agency (EPA) does not invoke the dispute resolution provisions of Section 22 within thirty (30) days, or Thursday, April 14, 2005.

If there are any questions regarding the enclosed plan, please contact me at telephone No. 650-746-7451 or Internet e-mail: stephen.f.tyahla@navy.mil.

Sincerely,

Stephen F. Tyahla, P.E., CHMM
Lead Remedial Project Manager

Enclosure
Copy to:
U.S. Environmental Protection Agency, Region 9 (Attn: Sonce de Vries)
National Oceanic and Atmospheric Administration (Attn: Denise Klimas)
National Oceanic and Atmospheric Administration (Attn: Laurie Sullivan)
U.S. Fish and Wildlife Service (Attn: Dan Welsh)
California Department of Toxic Substances Control Region 1 (Attn: Jim Pinasco)
California Regional Water Quality Control Board, SFBAY (Attn: Laurent Meillier)
California Department of Fish and Game (Attn: Frank Gray)

Re: DRAFT FINAL DATA GAPS SAMPLING AND ANALYLSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN) TIDAL AREA SITES 2, 9, AND 11, NAVAL WEAPONS STATION SEAL BEACH, DETACHMENT CONCORD, CONCORD, CALIFORNIA

Copy to (continued):
Contra Costa County Environmental Health, LEA (Attn: Agnes T. Vinluan)
Cal/EPA Integrated Waste Management Board Permitting &
Enforcement Division (Attn: Frank Davies)
Restoration Advisory Board (RAB) Co-Chair (Attn: Ms. Mary Lou Williams)
RAB Member Lisa Anich
RAB Member Chris Boyer
RAB Member Kevin Cornish
RAB Member David Griffith
RAB Member Gregory Glaser
RAB Member Jessica Hamburger
RAB Member Ed McGee
RAB Member Mario Menesini
RAB Member Ray O'Brien
RAB Member Igor Skaredoff
Clearwater Consultants (Attn: Patrick Lynch)
Tech Law, Inc. (Attn: Jennifer Hollingsworth)
NWS Seal Beach, N45WS (Attn: Margaret Wallerstein)
NWS Seal Beach, N09WS (Attn: Gregg Smith)
EFD Southwest (3) (Diane Silva- Admin Record/IR/Base copy)
IPT West (Attn: Lik-See Chung)
TtEMI Mountlake Terrace, WA (Attn: Joanna Canepa)
TtEMI San Francisco (Attn: John Bosche)

GENERAL SERVICES ADMINISTRATION
CONTRACT NUMBER GS-10F-0076K
DELIVERY ORDER NUMBER 62474-03-F-4015

Data Gaps Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan) Tidal Area Sites 2, 9, and 11

Naval Weapons Station Seal Beach Detachment Concord
Concord, California

GSA.0106.0015

DRAFT FINAL

March 14, 2005

Department of the Navy
Integrated Product Team, West
Daly City, California

TETRA TECH, INC.

GENERAL SERVICES ADMINISTRATION
Contract Number: GS-10F-0076K
Delivery Order: N62474-03-F-4015
GSA.0106.0014

Draft Final

Data Gaps Sampling and Analysis Plan

(Field Sampling Plan/Quality Assurance Project Plan)

Tidal Area Sites 2, 9, and 11

Naval Weapons Station Seal Beach Detachment Concord
Concord, California

March 14, 2005

Prepared for

NAVFAC Naval Facilities Engineering Command

DEPARTMENT OF THE NAVY
Integrated Product Team, West
Daly City, California

Prepared by

TETRA TECH EM INC.
135 Main Street, Suite 1800
San Francisco, California 94105
(415) 543-4880

John Bosche, P.E., Project Manager

Draft Final

Data Gaps Sampling and Analysis Plan
(Field Sampling Plan and Quality Assurance Project Plan)
Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord
Concord, California

Contract Number: GS-10F-0076K

Delivery Order: N62474-03-F-4015

PREPARED FOR:

DEPARTMENT OF THE NAVY

REVIEW AND APPROVAL

Tetra Tech Program

QA Manager: Kevin Hoch for Date: 09-Mar-05

Greg Swanson, Tetra Tech

Navy QA Officer: Narciso A. Ancog Date: 3/14/2005

Narciso A. Ancog

DISTRIBUTION LIST

Name	Responsibility	Affiliation
Steve Tyahla	Remedial Project Manager	Integrated Product Team West Naval Facilities Engineering Command
Margaret Wallerstein	Installation Restoration Program Manager	Naval Weapons Station Seal Beach Detachment
Narciso A. Ancog	Quality Assurance (QA) Officer	Naval Facilities Engineering Command, Southwest Division
Phillip Ramsey	Project Manager	U.S. Environmental Protection Agency Region 9
Jim Pinasco	Project Manager	California Environmental Protection Agency Department of Toxic Substances Control
Laurent Meillier	Project Manager	California Regional Water Quality Control Board, San Francisco Bay Region
Greg Swanson	Program QA Manager	Tetra Tech EM Inc.
Kevin Hoch	Project QA Officer	Tetra Tech EM Inc.
John Bosche	Project Manager	Tetra Tech EM Inc.
Sara Woolley	Analytical Coordinator	Tetra Tech EM Inc.
To be determined	Field Team Leader	Tetra Tech EM Inc.

TABLE 1: ELEMENTS OF EPA QA/R-5 IN RELATION TO THIS SAP

Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

EPA QA/R-5 QAPP ELEMENT[a]		Tetra Tech SAP	
A1	Title and Approval Sheet	Title and Approval Sheet	
A2	Table of Contents	Table of Contents	
A3	Distribution List	Distribution List	
A4	Project/Task Organization	1.4	Project Organization
A5	Problem Definition/Background	1.1	Problem Definition and Background
A6	Project/Task Description	1.2	Project Description
A7	Quality Objectives and Criteria	1.3	Quality Objectives and Criteria
A8	Special Training/Certification	1.5	Special Training and Certification
A9	Documents and Records	1.6	Documents and Records
B1	Sampling Process Design	2.1	Sampling Process Design
B2	Sampling Methods	2.2	Sampling Methods
B3	Sample Handling and Custody	2.3	Sample Handling and Custody
B4	Analytical Methods	2.4	Analytical Methods
B5	Quality Control	2.5	Quality Control
B6	Instrument/Equipment Testing, Inspection, and Maintenance	2.6	Equipment Testing, Inspection, and Maintenance
B7	Instrument/Equipment Calibration and Frequency	2.7	Instrument Calibration and Frequency
B8	Inspection/Acceptance of Supplies and Consumables	2.8	Inspection and Acceptance of Supplies and Consumables
B9	Non-direct Measurements	2.9	Nondirect Measurements
B10	Data Management	2.10	Data Management
C1	Assessment and Response Actions	3.1	Assessment and Response Actions
C2	Reports to Management	3.2	Reports to Management
D1	Data Review, Verification, and Validation	4.1	Data Review, Verification, and Validation
D2	Validation and Verification Methods		
D3	Reconciliation with User Requirements	4.2	Reconciliation with User Requirements

Notes:

a EPA. 2001. "EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5." Office of Environmental Information. Washington, DC. EPA/240/B-01/003. March.

EPA U.S. Environmental Protection Agency
QAPP Quality assurance project plan
SAP Sampling and analysis plan
Tetra Tech Tetra Tech EM Inc.

CONTENTS

CONTENTS (Continued)

Appendix

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

µg/kg	Microgram per kilogram
AA	Atomic absorption
ASTM	ASTM International (formerly the American Society for Testing and Materials)
AWQC	Ambient Water Quality Criterion
BERA	Baseline ecological risk assessment
bgs	Below ground surface
C	Centigrade
CLP	Contract Laboratory Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CPR	Cardiopulmonary resuscitation
DDT	Dichlorodiphenyltrichloroethane
DHS	Department of Health Services
DO	Delivery Order
DQA	Data quality assessment
DQO	Data quality objective
DTSC	Department of Toxic Substances Control
E&E	Ecology and Environment
EDD	Electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
ER-M	Effects range-median
FS	Feasibility study
FTL	Field team leader
GC	Gas chromatography
GFAA	Graphite furnace atomic absorption
GPC	Gel permeation chromatography
HASP	Health and safety plan
IAS	Initial assessment study
ID	Identification
IDL	Instrument detection limit
IDW	Investigation-derived waste
ICP	Inductively coupled plasma
IR	Installation Restoration
IRCDQM	Installation Restoration Chemical Data Quality Manual

LEL	Lower explosive limit
LCS	Laboratory control sample
LIMS	Laboratory information management system
MDL	Method detection limit
MEC	Munitions and explosives of concern
mg/kg	Milligram per kilogram
mL	Milliliter
MQO	Measurement quality objective
MS	Matrix spike
MSD	Matrix spike duplicate
MSR	Monthly status report
NEDTS	Navy Environmental Data Transfer Standards
NFESC	Naval Facilities Engineering Service Center
NWS	Naval Weapons Station
OSHA	Occupational Safety and Health Administration
PARCC	Precision, accuracy, representativeness, completeness, and comparability
PCP	Pentachlorophenol
PE	Performance evaluation
PPE	Personal protective equipment
PRC	PRC Environmental Management, Inc.
PRRL	Project-required reporting limit
QA	Quality assurance
QAPP	Quality assurance project plan
QC	Quality control
QCSR	Quality control summary report
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
RPD	Relative percent difference
RPM	Remedial project manager
SAP	Sampling and analysis plan
SBD	Seal Beach Detachment
SDG	Sample delivery group
SOP	Standard operating procedure
SOW	Statement of work
SQL	Sample quantitation limit
SVOC	Semivolatile organic compound
SWMU	Solid waste management unit

Tetra Tech	Tetra Tech EM Inc.
TIC	Tentatively identified compound
TSA	Technical systems audit
VOC	Volatile organic compound

1.0 PROJECT DESCRIPTION AND MANAGEMENT

Tetra Tech EM Inc. (Tetra Tech) plans to collect soil and groundwater samples within Tidal Area Sites 2, 9, and 11 to fill data gaps that were identified after the Draft Remedial Investigation (RI) dated August 8, 2003, was completed (Tetra Tech 2003). Site 2, the R Area; Site 9, the Froid and Taylor Roads Site; and Site 11, the Wood Hogger Site are located at Naval Weapons Station (NWS) Seal Beach Detachment (SBD) Concord. The location of Naval Weapons Station SBD Concord is illustrated on the site vicinity map, Figure 1. A more detailed site plan that illustrates the extent of Sites 2, 9, and 11 in the Tidal Area is presented on Figure 2.

After the state and federal regulatory agencies reviewed the draft RI report, the Navy agreed to fill data gaps identified and revise the RI. Tetra Tech prepared this sampling and analysis plan (SAP) to guide the field, laboratory, and data reporting efforts associated with this project.

The additional site characterization under this SAP will provide data to assist in reassessing site risks and evaluating prospective remedial alternatives in the revised RI and in the feasibility study (FS).

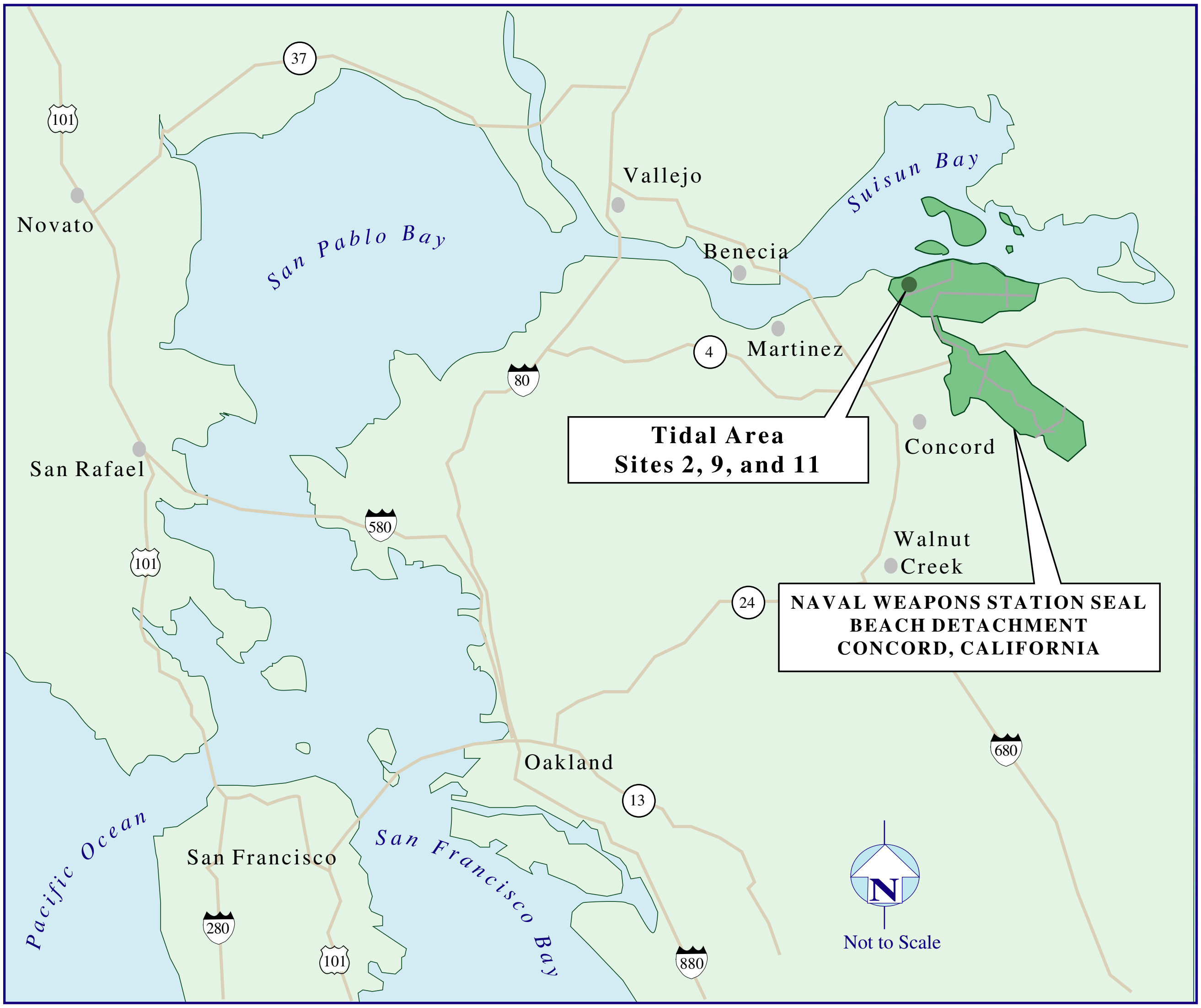
Table 1 follows the approval page at the beginning of this SAP. The table demonstrates how this SAP addresses all the elements of a quality assurance project plan (QAPP) required by the U.S. Environmental Protection Agency (EPA) QA/R-5 guidance document (EPA 2001).

Tables and figures follow their first reference in the text in this document. The following appendices are included with this SAP. Appendix A lists project-required reporting limits; Appendix B contains method precision and accuracy goals; Appendix C presents the site-specific health and safety plan (HASP); Appendix D contains all field forms; Appendix E contains Tetra Tech Standard Operating Procedures (SOP), Appendix F contains an example chain-of-custody form, Appendix G lists approved laboratories contracted to analyze samples under Navy contracts, and Appendix H present the Navy responses to Agency comments on the draft SAP.

1.1 PROBLEM DEFINITION AND BACKGROUND

This section describes the following:

- Purpose of the Investigation (Section 1.1.1)
- Problem to be Solved (Section 1.1.2)
- Facility Background (Section 1.1.3)
- Site Description (Section 1.1.4)
- Physical Setting (Section 1.1.5)
- Summary of Previous Investigations (Section 1.1.6)

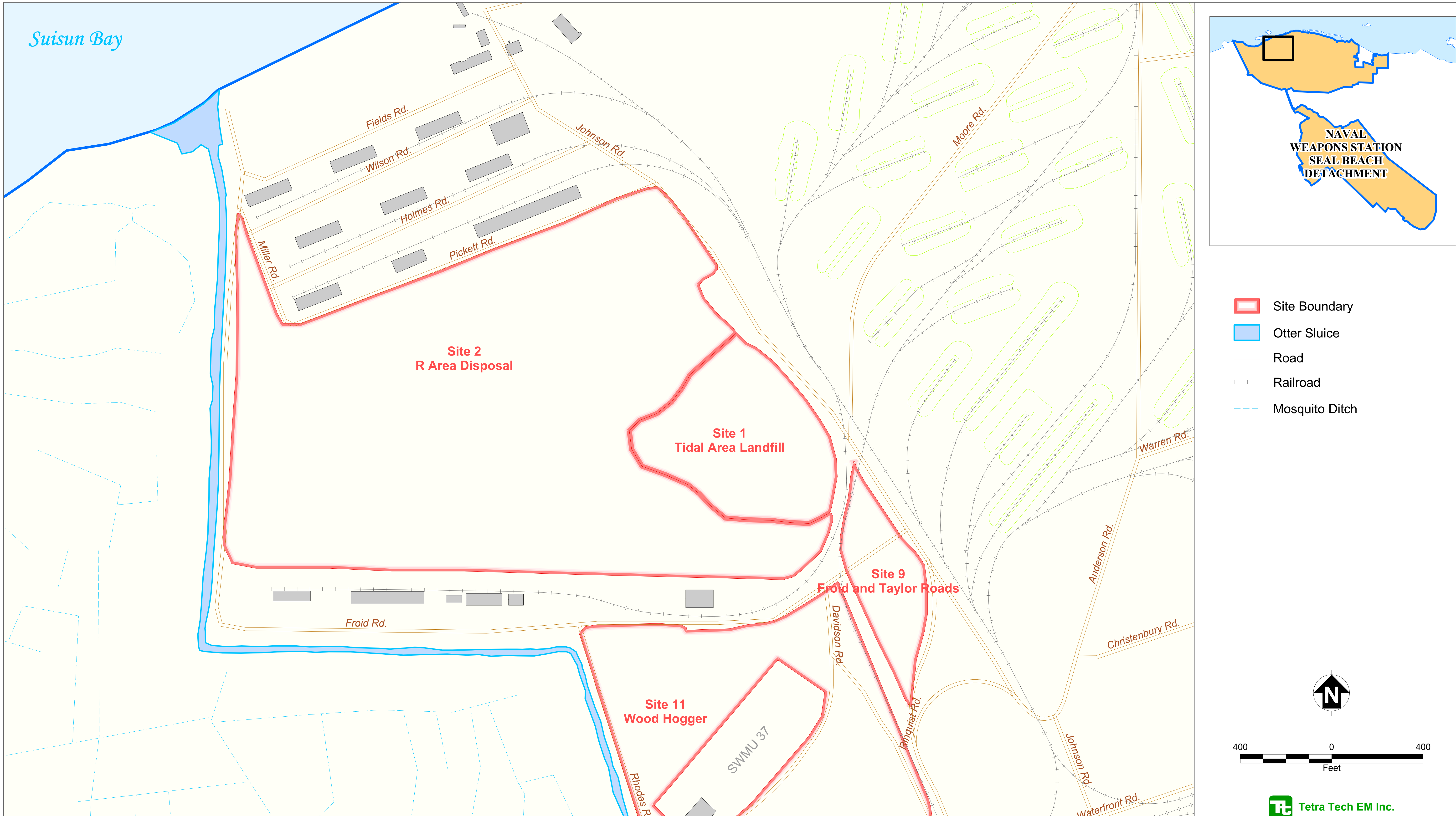


Tetra Tech EM Inc.

Naval Weapons Station Seal Beach Detachment
Concord, California
Integrated Product Team West, Daly City

FIGURE 1
SITE VICINITY MAP

Tidal Area Data Gap Investigation SAP



NAVAL WEAPONS STATION SEAL BEACH DETACHMENT
CONCORD, CALIFORNIA
Integrated Product Team West, Daly City

FIGURE 2
SITE PLAN
TIDAL AREA SITES 2, 9, AND 11

Tidal Area Data Gaps Investigation SAP

2005-03-14 V:\Concord\Projects\Tidal_GW_Invest\Site_Plan.mxd TtEMI-SF Aleksandr Zhuk

- Principal Decision-Makers (Section 1.1.7)
- Technical or Regulatory Standards (Section 1.1.8)

1.1.1 Purpose of the Investigation

The purpose of the additional investigation at Sites 2, 9, and 11 is to close two data gaps identified after the Revised Draft Final RI dated August 8, 2003, was completed (Tetra Tech 2003).

1.1.2 Problem to be Solved

The two data gaps identified after the RI was completed are described in the following sections.

1.1.2.1 Pesticides in Sediment at Site 9

Three pesticides (alpha chlordane, gamma chlordane, and dichlorodiphenyltrichloroethane [DDT]) were detected at concentrations above the effects range-median (ER-M) (Long 1990, Long 1995, and Long 1998), at location FTSSL102. The concentration of total DDTs (a summation of six chemicals) did not exceed the ER-M. An ER-M quotient (ER-M_q) of 0.63 was calculated at that location following the methods described in Long and MacDonald (1998) and explained in detail in the BERA. Concentrations of these constituents at location FTSSL102 are presented below:

Alpha-chlordane	11 micrograms per kilogram (µg/kg)
Gamma-chlordane	12 µg/kg
DDT	18 µg/kg
Total DDTs	43.2 µg/kg

The ER-M_q was categorized in the baseline ecological risk assessment as a "medium high" priority level. All other calculated ER-M_qs for Site 9 sediment were categorized as "lowest" or "medium to lowest" priority, following the guidelines in Long and MacDonald (1998). The conclusion of the baseline ecological risk assessment (BERA) was that the distribution of ER-M_qs across the site indicates little risk to populations of benthic invertebrates at Site 9.

The mean ER-M_q takes into account the additive effect of exposure to chemical mixtures and provides a standard by which to measure the cumulative effect of chemical mixtures on benthic invertebrates; its applicability to fishes is unknown. The mean ER-M_q is calculated by dividing the sum of the HQs of individual chemicals in a sample by the number of chemicals. In keeping with interpretations provided in Long and MacDonald (1998), sites with a mean ER-M_q greater than 1.5 were classified as highest priority for risk based on potential toxicity. Sites with a mean ER-M_q between 0.51 and 1.5 were classified as medium to high priority sites, and sites with mean ER-M_qs between 0.11 and 0.50 were considered medium to low priority sites.

EPA suggested that further investigations or remedial actions, such as hot spot removal, are warranted at location FTSSL102 to address potential risk to benthic invertebrates at that location. The Navy proposes collection of four step-out confirmation surface sediment samples at FTSSL102 to evaluate the presence of pesticides in sediment at FTSSL102. Constituent analysis will consist of pesticides. The locations of the four step-out samples are illustrated on Figure 3.

1.1.2.2 Mercury in Sediment at Site 11

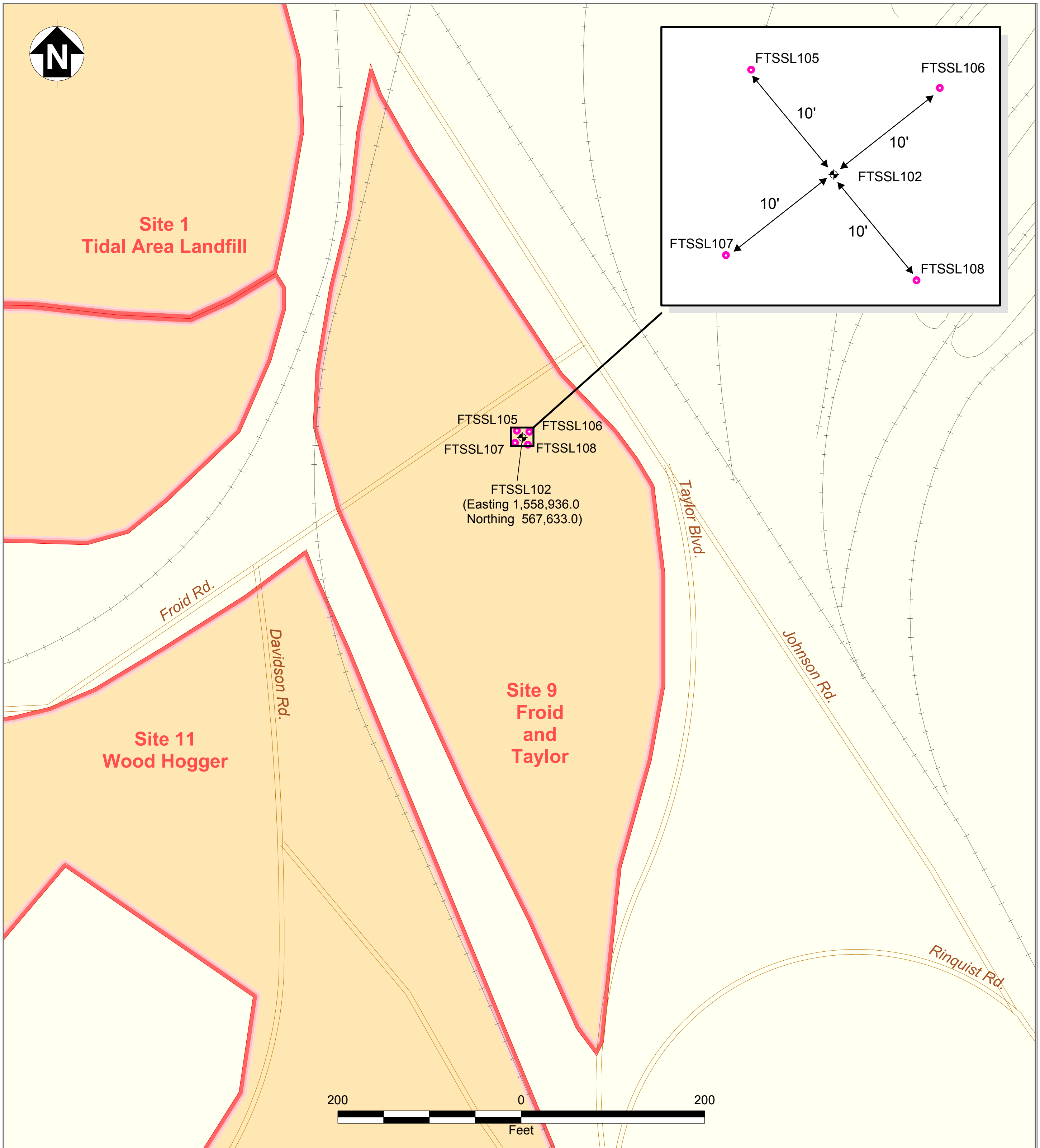
As reported in the BERA, the maximum concentrations of mercury detected at the site (from location WHSSB022) resulted in a calculation of a hazard quotient of 26.0. This location had an ER-M_q of 2.75 which is considered a “high” priority level. Mercury concentrations at three other locations within the southwest corner of the site exceeded the ER-M for mercury (0.71 mg/kg), but none of those locations had an ER-Mq of high priority.

None of the 14 sediment samples from Otter Slough were designated as highest priority based on ER-M_qs. Twelve samples (86 percent) were medium to low priority, and two samples were medium to high priority. In all samples, nickel was the only detected chemical that exceeded the ER-M. The maximum detected concentration of nickel (112.5 milligrams per kilogram [mg/kg]) in sediment exceeded the ER-M (51.6 mg/kg), but was less than the ambient concentration of nickel at the Tidal Area Sites (120 mg/kg). As such, nickel is not elevated in the Otter Slough sediment samples collected. Because no other chemical exceeded the ER-M, all other concentrations included in the ER-M_q were based on substituting one-half the detection limit for nondetected data. These data indicate *de minimis* risk to benthic invertebrates in Otter Slough.

There is uncertainty associated with the extent and risk posed by mercury at the Site 11 because detection limits achieved for surface water samples were greater than the Ambient Water Quality Criterion (AWQC) and the concentrations of mercury in sediment were highly variable. The highest concentration of mercury in sediment was detected at sample location WHSSB022 (18.5 mg/kg). The nearest sample collected in the vicinity of location WHSSB022 is WHSSBA08 (approximately 25 feet away). That sample showed a result for mercury of 0.44 mg/kg. The 50-fold differential between these adjacent samples illustrates the variability of sample results in the southwestern corner of the site, where the highest concentration of mercury was detected.

The BERA concluded that the distribution of ER-M_qs across the site indicates little risk to populations of benthic invertebrates or aquatic organisms at Site 11. However, because mercury bioaccumulates and biomagnifies, additional investigation of the nature and extent of mercury in this area is warranted.

Sampling to date suggests that concentrations of mercury are highly variable in soils and sediments in the southwestern corner of Site 11, and are elevated at several locations. The Navy plans to collect additional data to address the variability of mercury concentrations and to better characterize the general area of relatively high mercury concentrations. The intent of the additional sampling is not only to evaluate the existing conditions, but also to prepare for remedial actions, if required, by thorough characterization of the nature and extent of mercury contamination.



- Proposed Sample Location and Identification Number for Pesticide Analysis of Sediment
- Existing Sample Location and Identification number
- Site Boundaries
- Buildings
- Roads
- Railroads

Notes:
1. Samples will be collected from a depth of 0 to 0.5 feet below ground surface.
2. Well locatition is estimated.
3. Easting and northing coordinates (in feet) in NAD 1927 State Plane California zone 3 system.

Tetra Tech EM Inc.

NAVAL WEAPONS STATION SEAL BEACH DETACHMENT
CONCORD, CALIFORNIA
Integrated Product Team West, Daly City

FIGURE 3
FROID AND TAYLOR ROADS SITE SAMPLES

Tidal Area Data Gaps Investigation SAP

2005-02-17 V:\Concord\Projects\Tidal_GW_Invest\Froid_Taylor_Rd_smples.mxd TtEMI-SF Aleksandr Zhuk

The Navy will establish transects from one side of Otter Slough to the other. Soil and sediment samples will be collected from Otter Slough and from the adjoining embankments. Ten transect lines will be spaced along the length of Otter Slough near the southwestern corner of Site 11 at the locations illustrated on Figure 4. As illustrated on Figure 5, five locations will be sampled on each transect, and a continuous sample core will be driven from the marsh surface (or channel bottom) to a depth of 24 inches. Three discrete samples will be collected for analysis from each core. The discrete sample depths are listed below:

Sample 1	0 to 8 inches
Sample 2	8 to 16 inches
Sample 3	16 to 24 inches

Actual sample locations will be adjusted to accommodate the existing physical features of Otter Slough and the adjoining embankments; the schematic illustration depicted on Figure 5 will serve as a guide to locating samples in the field. Each sample location will be surveyed to measure horizontal position (x and y coordinates) and elevation (z coordinate).

Sediment at the site is extremely soft in some areas and is expected to be strongly bound with roots at some locations. Based on former sampling efforts by the Navy at the NWSSBD Concord Litigation Area marsh, retrieving samples can sometimes become difficult because the sampling device may not be able to penetrate the root mass. If difficulties are encountered during sampling, the sampling crew will make several attempts using various techniques (such as shovel or hand auger) to clear roots and collect subsurface samples at each location.

The location survey of the channel bottom and of samples from the bottom of Otter Slough will be approximate because much of the samples will be collected in Otter Slough from a boat in water that is nearly always flowing. The mud is so soft in some areas that measurement of channel bottom elevation will depend on how lightly the survey rod will be brought in contact with the channel bottom.

All samples indicated on Figure 5 are intended to be collected and delivered to the analytical laboratory. All mercury detected will be assumed to be methylated, precluding the need for specific analysis of methylmercury. Mercury will be analyzed sequentially in the samples, as described here, to minimize unnecessary analysis. Where the analytical results suggest that mercury is not present above background levels, adjacent and deeper samples will not be analyzed. The analysis will proceed as follows:

1. Surface samples from locations A, C, and E (see Figure 5) will be analyzed for mercury.
2. If the analytical result from surface sample A or E exceeds the Tidal Area ambient concentration (0.25 mg/kg), the next deepest core sample will be analyzed.
3. If the analytical result from surface sample C exceeds the Tidal Area ambient concentration for mercury, both horizontally (B and D surface) and vertically (C, 8 inches to 16 inches) adjacent samples will be analyzed.

Proposed Sample Transect Location

T1

100 0 100

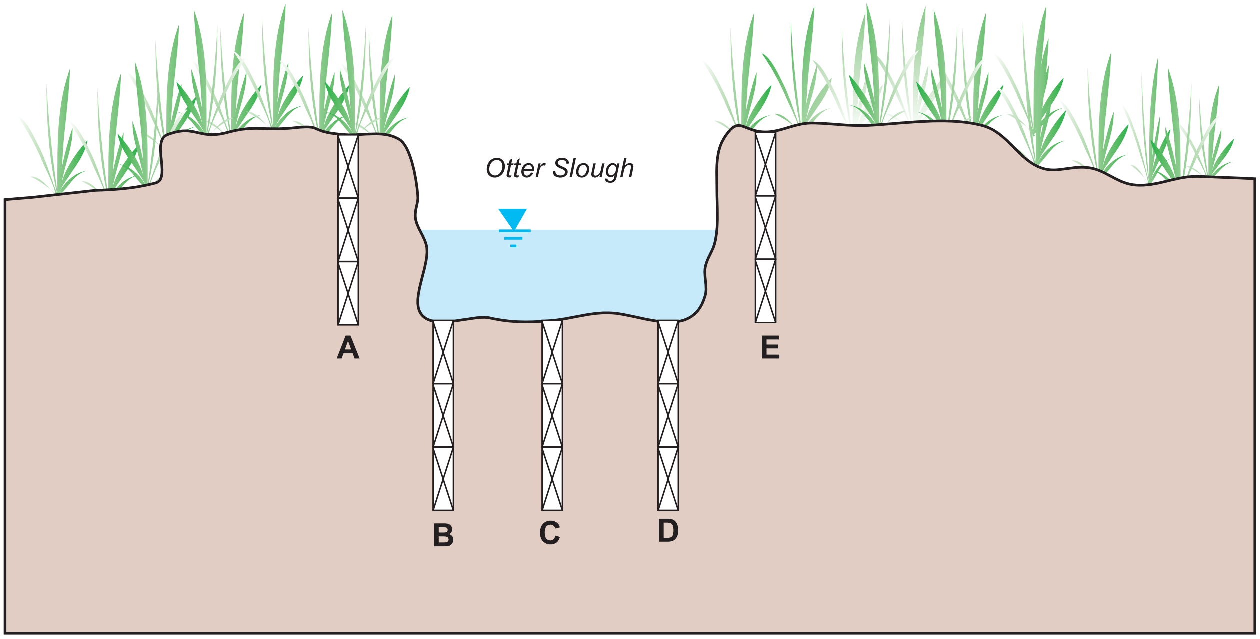
Scale in Feet

Tetra Tech EM Inc.

NAVAL WEAPONS STATION SEAL BEACH DETACHMENT
CONCORD, CALIFORNIA
Integrated Product Team West, Daly City

FIGURE 4
PROPOSED TRANSECTS AT WOOD HOGGER SITE TO INVESTIGATE MERCURY

Tidal Area Data Gaps Investigation SAP



Approximate proposed sediment sample location for mercury analysis. Actual locations will be determined in the field based upon topography and the configuration of Otter Slough.

Proposed Sample Depths

0 - 8 "

8" - 16"

16" - 24"

Schematic only - Not to Scale

Actual configuration of Otter Slough Channel and berms will be established by a land surveyor during the field work.

Tetra Tech EM Inc.

NAVAL WEAPONS STATION SEAL BEACH DETACHMENT
CONCORD, CALIFORNIA
Integrated Product Team West, Daly City

FIGURE 5
WOOD HOGGER SITE SAMPLE LOCATIONS ON TYPICAL TRANSECT
Tidal Area Data Gaps Investigation SAP

4. Any result that exceeds the ambient concentration will trigger subsequent analysis of horizontally and vertically adjacent samples until all transect samples are analyzed, or until results do not exceed ambient concentrations.

Between 3 and 15 samples per transect will be analyzed using this methodology.

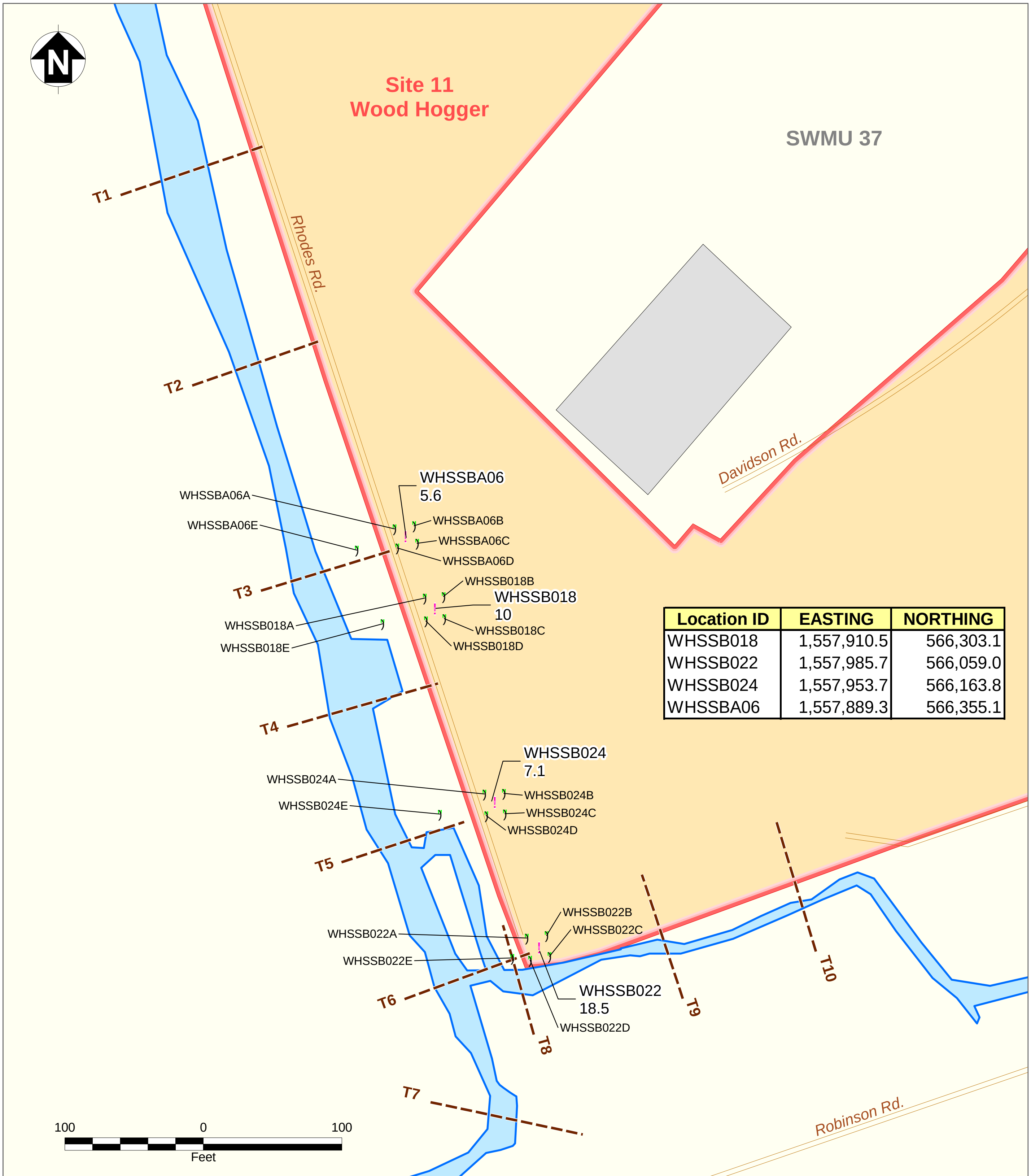
In addition to sampling along the 10 transects, five step-out samples will be collected at each of the four sample locations at the southwestern corner of the site where concentrations of mercury exceeded the ER-M. These four former sample locations and sixteen step-out sample locations are illustrated on Figure 6. These step-out samples will be used to assess the variability of mercury concentrations in soil in this area. The Navy plans to collect four of the step-out confirmation samples within 10 horizontal feet of the following locations; the concentration of mercury in the original sample is provided in parentheses:

- WHSSB022 (18.5 mg/kg)
- WHSSB018 (10 mg/kg)
- WHSSB024 (7.1 mg/kg)
- WHSSBA06 (5.6 mg/kg)

In addition to the 4 step-out samples, surrounding each of the above locations, a fifth step-out sample will be collected midway between the former sample and the bank of Otter Slough. The proposed locations of the 5 step-out samples are indicated on Figure 6.

All transect samples and step-out samples will be collected at the surface (0 to 0.5 feet below ground surface [bgs] or at the mudline). Constituent analysis will consist of mercury.

During a meeting with the agencies on May 14, 2002, the Navy was asked whether the accuracy of the location and configuration of Otter Slough on the RI map were adequate. In addition, agency personnel inquired whether previously sampled locations in Otter Sluice were surveyed, and whether the Navy could verify that the same locations were being revisited. As a result, the Navy has since verified that the location of all previous soil and sediment samples was established using land surveying techniques and that the locations of the samples are accurately depicted on the map. The location of Otter Slough is accurately indicated on Figure 4 of this SAP by means of an aerial photograph. The Navy plans to hire a land surveyor to accurately establish horizontal location and ground surface elevation on all soil sampling points on the east/west and north/south banks of Otter Slough at each transect location. The survey information, combined with aerial photographs, will be adequate to accurately establish the location and depth of Otter Slough.



Location ID	EASTING	NORTHING
WHSSB018	1,557,910.5	566,303.1
WHSSB022	1,557,985.7	566,059.0
WHSSB024	1,557,953.7	566,163.8
WHSSBA06	1,557,889.3	566,355.1

! Existing Sample Location with Concentration of Mercury Exceeding ER-M and Mercury Concentrations (mg/kg)

Proposed Location of Step-out Confirmation Sample (Locate within 10' of Orginal Sampling Location)

Proposed Sample Transect Location

Road

Otter Sluice Boundary

Buildings

Site 11 Boundary

Notes:
1. Samples will be collected from a depth of 0 to 0.5 feet below ground surface.
2. Easting and northing coordinates (in feet) in NAD 1927 State Plane California zone 3 system.

Tetra Tech EM Inc.

NAVAL WEAPONS STATION SEAL BEACH DETACHMENT
CONCORD, CALIFORNIA
Integrated Product Team West, Daly City

FIGURE 6
PROPOSED STEP-OUT SAMPLES AT WOOD HOGGER SITE TO INVESTIGATE ELEVATED MERCURY CONCENTRATIONS

Tidal Area Data Gaps Investigation SAP

2005-03-14 V:\Concord\Projects\Tidal_GW_Invest\s11WH_Step_Out_Samp.mxd TtEMI-SF Aleksandr Zhuk

1.1.3 Facility Background and Setting

Naval Weapons Station SBD Concord is located in the north-central portion of Contra Costa County, California, about 30 miles northeast of San Francisco. The facility, which encompasses about 13,000 acres, is bounded by Suisun Bay to the north and by the City of Concord to the south and west (see Figure 1). Currently, the facility contains two main land holdings: the Tidal Area and the Inland Area.

Land use in the vicinity of Naval Weapons Station SBD Concord is diverse, characterized by a mixture of industrial and residential areas, rangeland, and open space. The Navy retains ownership of the Tidal Area; however, as of 1999, an indefinite use permit has been issued that allows the U.S. Army to conduct operations in the area. The U.S. Army currently manages munitions and equipment loading there. Naval Weapons Station SBD Concord is a major explosive ordnance transshipment facility, providing storage, maintenance, and technical support for ordnance operations.

1.1.4 Site Descriptions

The following sections provide a physical description of Sites 9 and 11 where data gaps have been identified.

1.1.4.1 Site 9, Froid and Taylor Roads Site

Site 9, the Froid and Taylor Roads Site consists of an area about 800 by 300 feet that is bisected by Froid Road (see Figure 2). The site is bordered by Taylor Boulevard on the east, Site 11 on the southwest, and an unnamed dirt and asphalt road on the northwest. Within Site 9, a small, upland area north of Froid Road is vegetated by nonnative grasses. The area south of Froid Road contains a ponded area surrounded by a small wetland, which is the remnant channel of Otter Slough cut off from the main flow when the Navy channelized the slough in the 1940s. This site receives tidal inflow only during very high tides, followed by a gradual decrease in surface water and an increase in salinity (to more than 50 parts per thousand [ppt] in July 1994) through evaporation. High turbidity and low dissolved oxygen are typical of late summer periods of drydown (Western Ecological Services Company [WESCO] 1995). This section presents a brief history of operations at Site 9.

Site 9 has changed significantly from 1939 to the present, with development of Naval Weapons Station SBD Concord. Aerial photographs taken in 1939 indicate little activity in the vicinity of Site 9. By 1950, the site was encompassed by Taylor and Froid Roads. One small road that passed through the Site 9 is apparent from 1950 aerial photographs and can still be observed on the site. The natural slough that once passed through the Tidal Area sites was partially filled near Froid and Taylor Roads to construct roads and buildings. A curved portion of the slough remains; a maximum tidal fluctuation of 2 inches was measured there during the tidal influence study conducted in July 1994.

During the initial assessment study (IAS), a piece of ordnance was found on the shoulder of Froid Road, near its intersection with Taylor Boulevard. Explosive ordnance disposal personnel later identified this piece of ordnance as a spent, 5-inch, white phosphorus rocket round. An investigation of the surrounding area revealed scrap metal and other debris in the area south of the intersection of the two roads. The IAS also noted that the site was subject to tidal action; however, it presented no information to justify this statement. Although no specific incidents of hazardous materials disposal were linked directly to this site, its proximity to the other sites made it an area of concern during the IAS (E&E 1983).

During the RI, pesticides were detected at sample location FTSSL102 at concentrations that exceeded ER-Ms. Details on the pesticides detected at location FTSSL102 are presented in Section 1.1.2.1.

1.1.4.2 Site 11, Wood Hogger Site

The Site 11 is bordered by Otter Slough to the west and south, by Froid Road to the north, and by an unnamed dirt and asphalt road to the east. At the center of Site 11 is a rectangular open space that is partially paved and unvegetated. Although vacant now, the area was formerly used as a dunnage or materials storage yard. The storage area was aligned from southwest to northeast across Site 11. A railroad spur is located at the northern edge of the storage yard. Emergent wetland habitat occurs at the border of Site 11, with Otter Slough to the west and south. Areas of ponded surface water occur intermittently in the southern portion of the site, generally after heavy rains that coincide with high tides. Large areas in Site 11 were previously filled with silty clay, sands, and other fill materials.

Historically, Site 11 was used as a dunnage and scrap wood area. In the recent past, it was used on an intermittent basis as a dunnage storage yard for scrap metal, wood, and portable wood chipping machinery (wood hoggers). Aerial photographs from 1939, before the Navy owned the land, indicate little activity in the present Site 11. A major slough, trending from east to west, channeled through the present areas of Site 2, the landfill (Site 1), Site 9 and into Site 11. During construction of Naval Weapons Station SBD Concord, the slough was backfilled and Otter Slough was constructed around Site 2 and Site 11 to channel water to Suisun Bay. Aerial photographs indicate that by 1950 (with ongoing development of Naval Weapons Station SBD Concord), the fill was extended across Site 11 from the northeastern corner to the southwestern corner, forming the storage yard.

Aerial photographs from 1952 show this storage yard in use, with railroad tracks providing access from the northeastern corner of the site. Historical photographs and first-hand site observation indicate that a variety of wood and metal materials were stored in sections of the yard at various times. The storage yard in the center of the site was identified as solid waste management unit (SWMU) 37 during the Resource Conservation and Recovery Act (RCRA) facility assessment confirmation study (PRC 1997). Locations adjacent to this SWMU were investigated as part of the RI to assess it as a potential source of site chemicals.

From the early 1950s to the early 1970s, wood was burned in an incinerator at the southwestern corner of the Site 11. The concrete foundation of the incinerator remains on site. Between 1969 and 1973, dunnage and other wood scrap from Tidal Area operations were chipped using wood hogging equipment (IT 1992). Until about 1972, the chips were sold to the Fiberboard Company in Antioch, California (E&E 1983). When no market for the chips was available, the chips were deposited on the ground adjacent to the hogger. The chips were estimated to cover a 10-acre area at a thickness of up to 3.5 feet (IT 1992).

Some of the wood scraps chipped at the site came from ordnance crates returned from Vietnam. Most ammunition shipping crates used by the Marines in Vietnam, and some crates used by the Army, were treated with pentachlorophenol (PCP), a wood preservative that has since been identified as a contaminant of potential concern (COPC). The total amount of PCP-treated wood that may have been chipped and disposed of at the site was estimated at 20 tons (E&E 1983). Site 11 was identified in the IAS because of the on-site burial of wood chips, which were suspected to contain PCP. Wood chips were not expected to have been burned because the incinerator and hogger were not in operation at the same time.

1.1.4.3 Otter Slough

There are no records of spills or industrial activities at Otter Slough, and Otter Slough has not been established as an Installation Restoration (IR) site. However, because of the proximity of Otter Slough to the Tidal Area sites, including Sites 1, 2, 9, and 11, Otter Slough was included in the RI to evaluate whether contaminants associated with surface water or sediment have migrated to Otter Slough.

1.1.5 Physical Setting

Bay Mud is the predominant surface soil type Tidal Area. In developed areas, the Bay Mud is covered with fill soils, generally placed for the development of roads, railroads, or building pads. Based on available borehole data, the Bay Mud reaches a maximum thickness of about 40 feet in the northern part of the Tidal Area and thins southward toward Los Medanos Hills.

Groundwater conditions in the Tidal Area sites are detailed in a technical memorandum, "Confirmation Groundwater Sampling in the Tidal Area Sites" (Tetra Tech 1998) and are briefly summarized in this section.

The Tidal Area of Naval Weapons Station SBD Concord is characterized by an irregular piezometric surface and very thin (or absent) vadose zone. Surface water features in the Tidal Area act as local recharge and discharge zones for groundwater. Regionally, groundwater flows northward from Los Medanos Hills through the low-lying Tidal Area toward Suisun Bay. Surface water flows northward from Los Medanos Hills toward Suisun Bay in natural creeks, artificial ditches, canals, and culverts.

Groundwater at the Naval Weapons Station SBD Concord Tidal Area sites occurs in a shallow, unconfined water-bearing zone that is predominantly composed of silty clays. As Naval Weapons Station SBD Concord developed, site drainage was modified by digging drainage channels and filling both natural and manmade channels.

Otter Slough is a manmade channel that flows along the western and southern sides of the Tidal Area sites at Naval Weapons Station SBD Concord. The slough was designed to provide surface water drainage from Site 2 and Site 11 to Suisun Bay. A tide gate is located at the mouth of Otter Slough. It is designed as a one-way drainage structure to promote the flow of water into Suisun Bay from Otter Slough and prevent significant flooding of Otter Slough from high tides in Suisun Bay. In recent years, the tide gate flap valve has fallen off its hinges and the gate no longer functions as a one-way valve. This is one of the reasons portions of Site 2 have recently remained flooded throughout the year.

Groundwater measurements and a tidal influence study conducted in wells and piezometers over the years, before the flap valve for the tide gate failed at the mouth of Otter Slough, demonstrated that groundwater during wet and dry seasons flowed toward Site 2, thus creating a groundwater sink. Based on these observations, the RI concluded that the Tidal Area sites were not hydrologically connected with Suisun Bay except for a narrow zone along Baker Road, where some tidal influence was observed.

1.1.6 Summary of Previous Investigations

Site 2, Site 9, and Site 11 were investigated simultaneously, and the results were issued in the same series of reports. Preliminary studies completed include an IAS (E&E 1983) and the site investigation (SI) (IT Corporation 1992). These studies recommended additional evaluation of the Tidal Area sites. As a result, remedial investigation work plans (PRC 1994, 1995) were prepared, field and laboratory work was conducted, and an RI was prepared. The most recent version of the RI is a revised draft final, completed in August 2003 (Tetra Tech 2003), but which per agreement with the U.S. EPA is now considered a draft document which will be revised to incorporate the results of this data gaps study.

The RI concluded that Site 9 and Site 11 were appropriate for no further action based on the low risk posed to human health and the environment. However, the agencies reviewed the draft final (now draft) RI report and prepared comments that identified data gaps in the investigation. As a result, the agencies requested further field investigation and evaluation. The Navy met with the agencies on November 20, 2003, and prepared responses to agency comments on January 4, 2004. As a part of planning the investigation to address the data gaps identified, the Navy presented a proposed strategy, including a preliminary data quality objectives (DQO) analysis, to the agencies on May 14, 2004. Discussions with the agencies at that meeting, and the Navy's January 4 responses to comments, provide the basis of the sampling proposed in this SAP.

One additional study was conducted in the vicinity of the Site 11, the RCRA facility assessment confirmation study (PRC 1997). The RCRA facility assessment confirmation study evaluated the conditions at SWMU 37, which was surrounded by Site 11. The study recommended no further action at SWMU 37 because constituents were not detected at concentrations that posed unacceptable risk to human health or the environment.

1.1.7 Principal Decision-Makers

Principal decision-makers include the Navy and regulatory agencies. The lead regulatory agency for these sites is the U.S. EPA. Other principal decision-makers include DTSC, the California Regional Water Quality Control Board, the U.S. Fish and Wildlife Service, the State of California Department of Fish and Game, and the National Oceanic and Atmospheric Administration. These decision-makers will use the data collected from this project, in conjunction with data generated previously during the RI, to evaluate whether further action is necessary to protect human health and the environment.

1.1.8 Technical or Regulatory Standards

The Navy assumes that the ER-M will be the action level applied to evaluate contaminant concentrations in surface sediments collected from the Tidal Area sites. ER-Ms and project-required reporting limits (PRRL) are compared in Appendix A.

1.2 PROJECT DESCRIPTION

The following sections discuss the objectives and measurements of the project. Table 2 presents a schedule of sampling, analysis, and reporting for this project.

TABLE 2: IMPLEMENTATION SCHEDULE FOR SAMPLING, ANALYSIS, AND REPORTING
Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Milestone	Anticipated Date
Draft Sampling and Analysis Plan	July 13, 2004
Draft Final Sampling and Analysis Plan	March 15, 2005
Final Sampling and Analysis Plan	April 14, 2005
Field Investigation	May 2, 2005
Draft Final Remedial Investigation Report	October 20, 2005
Final Remedial Investigation Report	November 21, 2005

1.2.1 Project Objectives

As stated in Section 1.1, the primary objective of this additional investigation is to address data gaps identified by the regulatory agencies at Tidal Area Sites 2, 9, and 11. The following field activities will be carried out as part of this investigation:

- Collect four step-out confirmation samples of surface sediment near FTSSL102 to evaluate the presence of chlordane and DDT.

- Collect surface and subsurface sediment samples along ten transect lines to evaluate the nature and extent of mercury at the southwestern corner of Site 11.
- Collect confirmation samples at four locations where higher concentrations of mercury were detected in the past to confirm the former results. At each former sample location, collect five surface soil samples to evaluate the variability of mercury concentrations.

1.2.2 Project Measurements

Surface sediment will be analyzed using EPA methodology, as described in Section 2.4.

1.3 Quality Objectives and Criteria

The following sections present the DQOs and measurement quality objectives (MQO) identified for this SAP.

1.3.1 Data Quality Objectives

DQOs are qualitative and quantitative statements developed through the seven-step DQO process (EPA 2000b, 2000d). The DQOs clarify the study objective, define the most appropriate data to collect and the conditions under which to collect them, and specify tolerable limits on decision errors that will be used as the basis for establishing the quantity and quality of data needed to support decision-making. The DQOs are used to develop a scientific and resource-effective design for data collection. The seven steps of the DQO process for this project are presented in Table 3.

1.3.2 Measurement Quality Objectives

All analytical results will be evaluated in accordance with precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters to document the quality of the data and to ensure that the data are of sufficient quality to meet the project objectives. Precision and accuracy will be evaluated quantitatively by collecting the quality control (QC) samples listed in Table 4. Specific precision and accuracy goals for these QC samples are listed in Appendix B.

The sections below describe how each of the PARCC parameters will be assessed within this project.

TABLE 3: DATA QUALITY OBJECTIVES

Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

STEP 1: State the Problem

Two data gaps have been identified:

1. Three pesticides (alpha chlordane, gamma chlordane, DDT) were detected at concentrations above the ER-M at location FTSSL102 at the Froid and Taylor Roads site (Site 9). The location was identified in the baseline ecological risk assessment as “medium high” priority based on the ER-M_q. All other location-specific ER-M_qs at Site 9 were categorized as “lowest” or “medium to lowest” priority. The lateral extent of pesticides exceeding the ER-M is unknown because only one of the former samples at Site 9 contains pesticides at concentrations that the ER-M.
2. Several samples of sediment from the southwest corner of the Wood Hogger Site (Site 11) contain mercury at concentrations that exceed the ER-M. The extent that mercury has migrated to Otter Slough from these areas has not been evaluated. Uncertainty is associated with the extent of and risk posed by mercury at the Wood Hogger (Site 11) because of high detection limits achieved for surface water samples and highly variable concentrations in sediment.
3. Mercury concentrations in sediment exceeded the ER-M in four samples from the southwest corner of Site 11. These samples include locations WHSSB022 (18.5 mg/kg), WHSSB018 (10 mg/kg), WHSSB024 (7.1 mg/kg), and WHSSBA06 (5.6 mg/kg). Sample WHSSBA08 (detected mercury concentration of 0.44 mg/kg) was collected adjacent to WHSSB022 (detected mercury concentration of 18.5 mg/kg). The 50-fold differential between these adjacent samples illustrates the variability of sample results in the southwestern corner of the site, where the highest concentration of mercury was detected. The variability of mercury concentrations in sediment is unknown.

STEP 2: Identify the Decisions

1. Are alpha-chlordane, gamma-chlordane, DDT, or total DDTs present at concentrations above the ER-M at Site 9 at locations close to former sample FTSSL 102?
2. Are concentrations of DDTs detected in sediment higher than the UCL_{95} concentration used in the food-chain model?
3. Are concentrations of mercury detected in sediment higher than the UCL_{95} concentration used in the food-chain model?

STEP 3: Identify Inputs to the Decisions

- Validated analytical results will be obtained for alpha-chlordane, gamma-chlordane, DDT, and mercury in sediments.
- Ecologic risk-based screening levels

STEP 4: Define Study Boundaries

- The extent of the study area is defined as shown on Figures 3, 4, 5, and 6.
- Sampling is expected to take place in May 2005.

TABLE 3: DATA QUALITY OBJECTIVES (Continued)

Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

STEP 5: Develop Decision Rules
1. If alpha-chlordane, gamma-chlordane, or DDT is present at concentrations above the ER-M at the new Site 9 sample locations, then the results will be used to reevaluate the ecological risk in the vicinity of FTSSL102. Otherwise, no further action is required. 2. If concentrations of DDTs detected in sediment are higher than the UCL_{95} concentration used in the food-chain model, then risk to upper trophic level receptors will be re-evaluated; if DDT concentrations detected in sediment are lower than the UCL_{95} concentration used in the food-chain model, then risk to upper trophic level receptors will not require re-evaluation. 3. If concentrations of mercury in surface sediment at Site 11 or in the vicinity of Otter Slough are higher than the UCL_{95} concentration used in the food-chain model, then risk to upper trophic level receptors will be re-evaluated ; if mercury concentrations detected in sediment are lower than the UCL_{95} concentration used in the food-chain model, then risk to upper trophic level receptors will not require re-evaluation.
STEP 6: Specify Tolerable Limits on Decision Errors
The number of samples and sampling locations for conducting additional chemical analysis on soil and sediment samples are based on professional judgment. Specification of tolerable limits on decision errors through the use of standard statistical methods is not applicable to this sampling design.
STEP 7: Optimize the Sampling Design
The design was optimized using professional judgment and sampling was biased to fill the data gaps identified. Sample design was not optimized using a statistical test.

Notes:

ER-M	Effects range-median
DDT	Dichlorodiphenyltrichloroethane
mg/kg	Milligrams per kilogram

TABLE 4: QC SAMPLES FOR PRECISION AND ACCURACY
Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

QC Type	Precision	Accuracy	Frequency
Field QC	None	Equipment Rinsate	1 per day per type of non-disposable sampling equipment
		Source Water Blank	1 per source
Laboratory QC	Relative percent difference	Method Blanks	Method Blank = 1/20 samples
		LCS or Blank Spikes	LCS or Blank Spikes = 1/20 samples
		Surrogate Standards Percent Recovery	Surrogate Standards = Every sample for organic analysis by gas chromatography

Notes:

LCS Laboratory control sample
QC Quality control

1.3.2.1 Precision

Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. Usually, combined field and laboratory precision is evaluated by collecting and analyzing field duplicates and then calculating the variance between the samples, typically as a relative percent difference (RPD):

$$RPD = \frac{|A - B|}{(A + B)/2} \; x \; 100\%$$

where:

A = First duplicate concentration
B = Second duplicate concentration

Field sampling precision is evaluated by analyzing field duplicate samples. Because of the heterogeneous nature of sediments and the small amount of sediment that is analyzed, it is not practical to obtain true field duplicate samples, as further explained in Section 2.5.2.1 of this SAP. Field duplicates will not be collected for this project.

Laboratory analytical precision is evaluated by analyzing laboratory duplicates or matrix spikes (MS) and matrix spike duplicates (MSD). For this project, MS/MSD samples will be generated for all analytes. The results of the analysis of each MS/MSD pair will be used to calculate an RPD for evaluating precision.

1.3.2.2 Accuracy

A program of sample spiking will be conducted to evaluate laboratory accuracy. This program includes analysis of the MS and MSD samples, laboratory control samples (LCS) or blank spikes, surrogate standards, and method blanks. MS and MSD samples will be prepared and analyzed at a frequency of 5 percent. LCS or blank spikes are also analyzed at a frequency of 5 percent. Surrogate standards, where available, are added to every sample analyzed for organic constituents. The results of the spiked samples are used to calculate the percent recovery for evaluating accuracy.

$$Percent\ \mathrm{Recovery} = \frac{S - C}{T} \ x \ 100$$

where:

S = Measured spike sample concentration

C = Sample concentration

T = True or actual concentration of the spike

Appendix B presents accuracy goals for the investigation based on the percent recovery of matrix and surrogate spikes. Results that fall outside the accuracy goals will be further evaluated on the basis on the results of other QC samples.

1.3.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent the characteristics of a population, variations in a parameter at a sampling point, or an environmental condition that they are intended to represent. For this project, representative data will be obtained through careful selection of sampling locations and analytical parameters. Representative data will also be obtained through proper collection and handling of samples to avoid interference and minimize contamination.

Representativeness of data will also be ensured through the consistent application of established field and laboratory procedures. Field blanks (if appropriate) and laboratory blank samples will be evaluated for the presence of contaminants to aid in evaluating the representativeness of sample results. Data determined to be nonrepresentative, by comparison with existing data, will be used only if accompanied by appropriate qualifiers and limits of uncertainty.

1.3.2.4 Completeness

Completeness is a measure of the percentage of project-specific data that are valid. Valid data are obtained when samples are collected and analyzed in accordance with QC procedures outlined in this SAP, and when none of the QC criteria that affect data usability is exceeded. When all data validation is completed, the percent completeness value will be calculated by dividing the number of useable sample results by the total number of sample results planned for this investigation.

As discussed further in Section 4.2, completeness will also be evaluated as part of the data quality assessment process (EPA 2000c). This evaluation will help determine whether any limitations are associated with the decisions to be made based on the data collected.

1.3.2.5 Comparability

Comparability expresses the confidence with which one data set can be compared with another. Comparability of data will be achieved by consistently following standard field and laboratory procedures and by using standard measurement units in reporting analytical data.

1.3.2.6 Detection and Quantitation Limits

The method detection limit (MDL) is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The quantitation limit represents the lowest concentration of an analyte that can be accurately and reproducibly quantified in a sample matrix. PRRLs are contractually specified maximum quantitation limits for specific analytical methods and sample matrices, such as soil or water, and are typically several times the MDL to allow for matrix effects. PRRLs, which are established by Tetra Tech in the scope of work for subcontract laboratories, are set to establish minimum criteria for laboratory performance; actual laboratory quantitation limits may be substantially lower. The PPRLs required for this project are identified on Table A-1 in Appendix A.

1.4 PROJECT ORGANIZATION

Table 5 presents the responsibilities and contact information for key personnel involved in sampling activities at the Tidal Area. In some cases, more than one responsibility has been assigned to one person. Figure 7 presents the organization of the project team.

1.5 SPECIAL TRAINING AND CERTIFICATION

This section outlines the training and certification required to complete the activities described in this SAP. The following sections describe the requirements for personnel working on site.

1.5.1 Health and Safety Training

Personnel who work at hazardous waste project sites are required to meet the Occupational Safety and Health Administration (OSHA) training requirements defined in Title 29 *Code of Federal Regulations* (CFR) Part 1910.120(e). These requirements include: (1) 40 hours of formal off-site instruction; (2) a minimum of 3 days of actual on-site field experience under the supervision of a trained and experienced field supervisor; and (3) 8 hours of annual refresher training. OSHA training will include a refresher course on ordnance and explosive waste (OEW). Field personnel who directly supervise employees engaged in hazardous waste operations also receive at least 8 additional hours of specialized supervisor training. The supervisor training covers health and safety program requirements, training requirements,

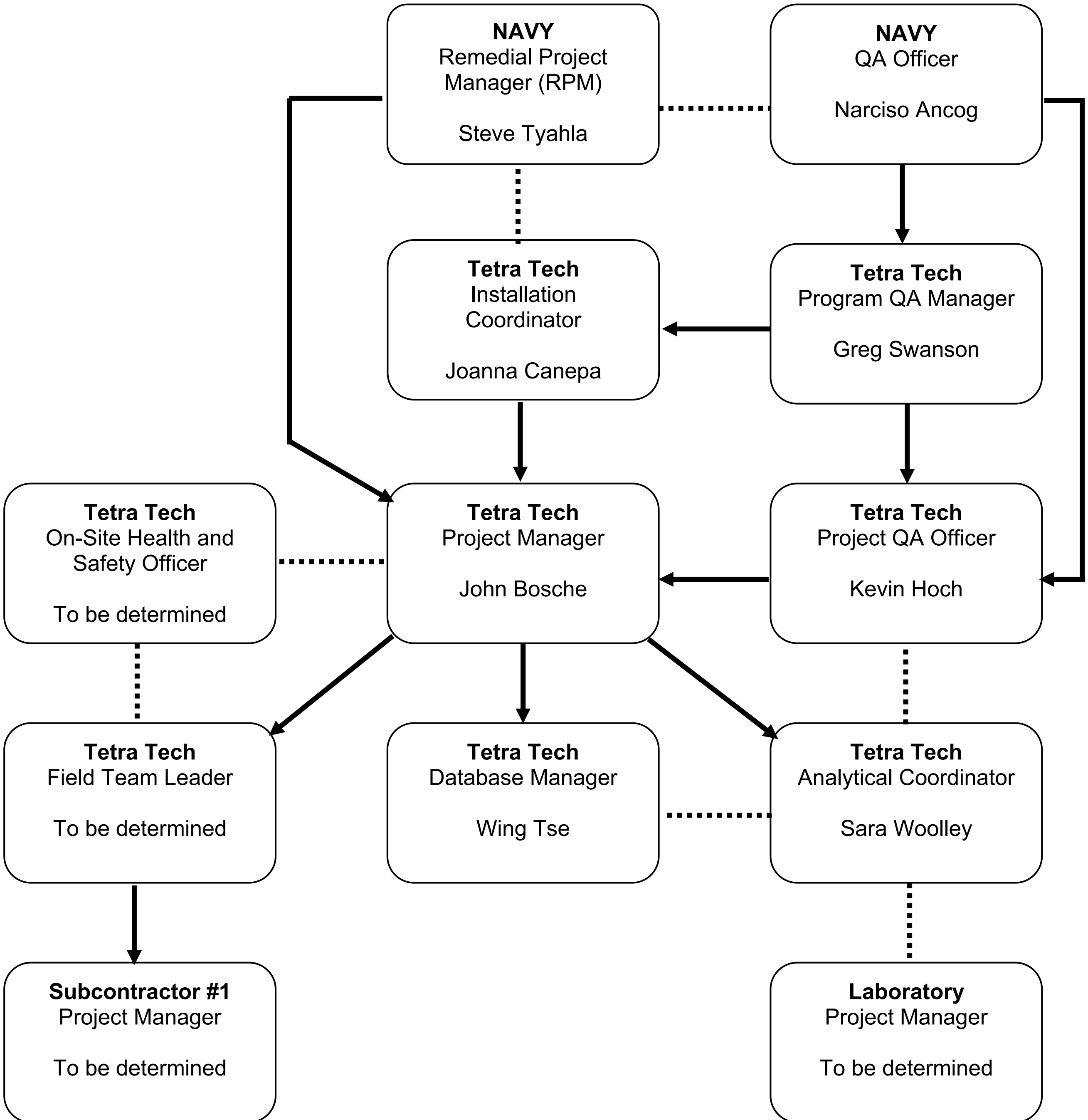
TABLE 5: KEY PERSONNEL

Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11, Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Name	Organization	Role	Responsibilities	Contact Information
Steve Tyahla	Navy	Remedial project manager	Responsible for overall project execution and for coordination with base representatives, regulatory agencies, and Navy management Actively participates in DQO process Provides management and technical oversight during data collection	Department of the Navy Naval Facilities Engineering Command Engineering Field Activity, West stephen.f.tyahla@navy.mil (650) 746-7451
Narciso A. Ancog	Navy	QA officer	Responsible for QA issues for all Southwest Division (SWDIV) environmental work Provides government oversight of Tetra Tech's quality assurance (QA) program Reviews and approves SAP and any significant modifications Has authority to suspend project activities if Navy quality requirements are not met	Naval Facilities Engineering Command, SWDIV, San Diego, CA narciso.ancog@navy.mil (619) 532-3046
Joanna Canepa	Tetra Tech	Installation coordinator	Responsible for ensuring that all Tetra Tech activities at this installation are carried out in accordance with current Navy requirements and Tetra Tech program guidance	Tetra Tech, San Francisco, CA joanna.canepa@ttemi.com (415) 222-8362
John Bosche	Tetra Tech	Project manager	Responsible for implementing all activities called out in delivery order (DO) Prepares or supervises preparation of SAP Monitors and directs field activities to ensure compliance with requirements of the SAP	Tetra Tech, San Francisco, CA john.bosche@ttemi.com (415) 222-8295
Greg Swanson	Tetra Tech	Program QA manager	Responsible for regular discussion and resolution of QA issues with Navy QA officer Provides program-level QA guidance to installation coordinator, project manager, and project teams Reviews and approves SAPs Identifies nonconformances through audits and other QA review activities and recommends corrective action	Tetra Tech, San Diego, CA Greg.Swanson@ttemi.com (619) 525-7188
Kevin Hoch	Tetra Tech	Project QA officer	Responsible for providing guidance to project teams that are preparing SAPs Verifies that data collection methods specified in SAP comply with Navy and Tetra Tech requirements May conduct laboratory evaluations and audits	Tetra Tech, Sacramento, CA kevin.hoch@ttemi.com (916) 853-4506

TABLE 5: KEY PERSONNEL (Continued)
Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11, Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Name	Organization	Role	Responsibilities	Contact Information
To be determined	Tetra Tech	Field team leader	Responsible for directing day-to-day field activities conducted by Tetra Tech and subcontractor personnel Verifies that field sampling and measurement procedures follow SAP Provides project manager with regular reports on status of field activities	To be determined
To be determined	Tetra Tech	On-site safety officer	Responsible for implementing health and safety plan and for determining appropriate site control measures and personal protection levels Conducts safety briefings for Tetra Tech and subcontractor personnel and site visitors Can suspend operations that threaten health and safety	To be determined
Sara Woolley	Tetra Tech	Analytical coordinator	Responsible for working with project team to define analytical requirements Assists in selecting a pre-qualified laboratory to complete required analyses (see Section 2.4 of SAP) Coordinates with laboratory project manager on analytical requirements, delivery schedules, and logistics Reviews laboratory data before they are released to project team	Tetra Tech, San Francisco, CA Sara.Woolley@ttemi.com (415) 222-8311
Wing Tse	Tetra Tech	Database manager	Responsible for developing, monitoring, and maintaining project database under guidance of project manager Works with analytical coordinator during preparation of SAP to resolve sample identification issues	Tetra Tech, San Francisco, CA wing.tse@ttemi.com (415) 222-8326
To be determined	Laboratory	Project manager	Responsible for delivering analytical services that meet requirements of SAP Reviews SAP to understand analytical requirements Works with Tetra Tech analytical coordinator to confirm sample delivery schedules Reviews laboratory data package before it is delivered to Tetra Tech	To be determined
To be determined	Subcontractor	Project manager	Responsible for ensuring that subcontractor activities are conducted in accordance with requirements of SAP Coordinates subcontractor activities with Tetra Tech project manager or field team leader	To be determined



Tetra Tech EM

Naval Weapons Station Seal Beach Detachment

Integrated Product Team West, Daly City

FIGURE 7

PROJECT TEAM ORGANIZATION CHART

Tidal Area Data Gaps Investigation SAP

personal protective equipment (PPE) requirements, spill containment program, and health-hazard monitoring procedures and techniques. At least one member of every field team will maintain current certification in the American Red Cross "Multimedia First Aid" and "Cardiopulmonary Resuscitation (CPR) Modular," or equivalent. Personnel performing the sampling beneath the building will have confined space entry training.

Copies of contractor's health and safety training records, including course completion certifications for the initial and refresher health and safety training, specialized supervisor training, and first aid and CPR training, are maintained in project files.

Before work begins at a specific hazardous waste project site, contractor's personnel are required to undergo site-specific training that thoroughly covers the following areas:

- Names of personnel and alternates responsible for health and safety at a hazardous waste project site
- Health and safety hazards present on site
- Selection of the appropriate personal protection levels
- Correct use of PPE
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment on site
- Medical surveillance requirements, including recognition of symptoms and signs that might indicate overexposure to hazardous substances
- Contents of the site-specific HASP (Appendix C)

1.5.2 Subcontractor Training

Subcontractors who work on site will certify that their employees have been trained for work on hazardous waste project sites. Training will meet OSHA requirements defined in 29 CFR 1910.120(e). Before work begins at the project site, subcontractors will submit copies of the training certification for each employee to contractor.

All employees of associate and professional services firms and technical services subcontractors will attend a safety briefing and complete the "Safety Meeting Sign-Off Sheet" before they conduct on-site work. This briefing covers the topics described in Section 1.5.1 and is conducted by the Tetra Tech on-site health and safety officer (OHSO) or other qualified person.

1.5.3 Specialized Training and Certification Requirements

This projects requires no additional training or certification beyond the requirements defined in 29 CFR 1910.120(e).

1.6 DOCUMENTS AND RECORDS

Documentation is critical for evaluating the success of any environmental data collection activity. The following sections discuss the requirements for documenting field activities and for preparing laboratory data packages. This section also describes reports that will be generated as a result of this project.

1.6.1 Field Documentation

Complete and accurate documentation is essential to demonstrate that field measurement and sampling procedures are carried out as described in the SAP. Field personnel will use permanently bound field logbooks with sequentially numbered pages to record and document field activities. The logbook will list the contract name and number, the DO number, the site name, and the names of subcontractors, the service client, and the project manager. At a minimum, the following information will be recorded in the field logbook:

- Name and affiliation of all on-site personnel or visitors
- Weather conditions during the field activity
- Summary of daily activities and significant events
- Notes of conversations with coordinating officials
- References to other field logbooks or forms that contain specific information
- Discussions of problems encountered and their resolution
- Discussions of deviations from the SAP or other governing documents
- Description of all photographs taken

The field team will also use the various field forms included in Appendix D to record field activities.

1.6.2 Summary Data Package

The subcontracted laboratory will prepare summary data packages in accordance with the instructions provided in the EPA Contract Laboratory Program (CLP) statements of work (SOW) (EPA 1999b, 2000a). The summary data package will consist of a case narrative, copies of all associated chain-of-custody forms, sample results, and quality assurance and quality control (QA/QC) summaries. The case narrative will include the following information:

- Subcontractor name, project name, DO number, project order number, sample delivery group (SDG) number, and a table that cross-references client and laboratory sample identification (ID) numbers
- Detailed documentation of all sample shipping and receiving, preparation, analytical, and quality deficiencies

- Thorough explanation of all instances of manual integration
- Copies of all associated nonconformance and corrective action forms that will describe the nature of the deficiency and the corrective action taken
- Copies of all associated sample receipt notices

Additional requirements for the summary data package are outlined in Table 6. The subcontracting laboratory will provide Tetra Tech with two copies of the summary data package within 21 days after it receives the last sample in the SDG.

1.6.3 Full Data Package

When a full data package is required, the laboratory will prepare data packages in accordance with the instructions provided in the EPA CLP SOWs (EPA 1999b, 2000a). Full data packages will contain all of the information from the summary data package and all associated raw data. Requirements for the full data package are outlined in Table 6. Full data packages are due to Tetra Tech within 21 days after the last sample in the SDG is received. Unless otherwise requested, the subcontractor will deliver one copy of the full data package.

The subcontracted laboratory will provide electronic data deliverables (EDDs) for all analytical results. An automated laboratory information management system (LIMS) must be used to produce the EDDs. Manual creation of the deliverable (data entry by hand) is unacceptable. The laboratory will verify EDDs internally before they are issued. The EDDs will correspond exactly to the hard-copy data. No duplicate data will be submitted. EDDs will be delivered in a format compatible with Navy Environmental Data Transfer Standards (NEDTS). Results that should be included in all EDDs are as follows:

- Target analyte results for each sample and associated analytical methods requested on the chain-of-custody form
- Method and instrument blanks and preparation and calibration blank results reported for the SDG
- Percent recoveries for the spike compounds in the MS, MSDs, blank spikes, or LCSs
- Matrix duplicate results reported for the SDG
- All re-analysis, re-extractions, or dilutions reported for the SDG, including any associated with samples and the specified laboratory QC samples

1.6.4 Data Package Format

Electronic and hard-copy data must be retained by the Navy for a minimum of 3 and 10 years, respectively, after final data have been submitted. The laboratory subcontractor will use an electronic storage device capable of recording data for long-term, off-line storage. Raw data will be retained on an electronic data archival system.

TABLE 6: REQUIREMENTS FOR SUMMARY AND FULL DATA PACKAGES

Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11, Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Requirements for Summary Data Packages – Organic Analysis		Requirements for Summary Data Packages – Inorganic Analysis	
<u>Section I</u>	**Case Narrative**	**<u>Section I</u>**	**Case Narrative**
1.	Case narrative	1.	Case narrative
2.	Copies of nonconformance and corrective action forms	2.	Copies of nonconformance and corrective action forms
3.	Chain-of-custody forms	3.	Chain-of-custody forms
4.	Copies of sample receipt notices	4.	Copies of sample receipt notices
5.	Internal tracking documents, as applicable	5.	Internal tracking documents, as applicable
<u>Section II</u>	**Sample Results - Form I for the following:**	**<u>Section II</u>**	**Sample Results - Form I for the following:**
1.	Environmental samples, including dilutions and re-analysis	1.	Environmental samples, including dilutions and re-analysis
2.	Tentatively identified compounds (TIC) (VOC and SVOC only)		
<u>Section III</u>	**QA/QC Summaries - Forms II through XI for the following:**	**<u>Section III</u>**	**QA/QC Summaries** – Forms II through XIV for the following:
1.	System monitoring compound and surrogate recoveries (Form II)	1.	Initial and continuing calibration verifications (Form II)
2.	MS and MSD recoveries and RPDs (Forms I and III)	2.	PRRL standard (Form II)
3.	Blank spike or LCS recoveries (Forms I and III-Z)	3.	Detection limit standard (Form II-Z)
4.	Method blanks (Forms I and IV)	4.	Method blanks, continuing calibration blanks, and preparation blanks (Form III)
5.	Performance check (Form V)	5.	Inductively coupled plasma (ICP) interference-check samples (Form IV)
6.	Initial calibrations with retention time information (Form VI)	6.	MS and post-digestion spikes (Forms V and V-Z)
7.	Continuing calibrations with retention time information (Form VII)	7.	Sample duplicates (Form VI)
8.	Quantitation limit standard (Form VII-Z)	8.	LCSs (Form VII)
9.	Internal standard areas and retention times (Form VIII)	9.	Method of standard additions (Form VIII)
10.	Analytical sequence (Forms VIII-D and VIII-Z)	10.	ICP serial dilution (Form IX)
11.	Gel permeation chromatography (GPC) calibration (Form IX)	11.	IDL (Form X)
12.	Single component analyte identification (Form X)	12.	ICP interelement correction factors (Form XI)
13.	Multicomponent analyte identification (Form X-Z)	13.	ICP linear working range (Form XII)
14.	Matrix-specific method detection limit (MDL) (Form XI-Z)		

TABLE 6: REQUIREMENTS FOR SUMMARY AND FULL DATA PACKAGES (Continued)

Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11, Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Requirements for Full Data Packages -- Organic Analysis

Sections I, II, and III **Summary Package**

Section IV **Sample Raw Data –** indicated form, plus all raw data

1. Analytical results, including dilutions and re-analysis (Forms I and X)
2. Tentatively identified compounds (TICs) (Form I — VOC and SVOC only)

Section V **QC Raw Data** – indicated form, plus all raw data

1. Method blanks (Form I)
2. MS and MSD samples (Form I)
3. Blank spikes or LCSs (Form I)

Section VI **Standard Raw Data –** indicated form, plus all raw data

1. Performance check (Form V)
2. Initial calibrations, with retention-time information (Form VI)
3. Continuing calibrations, with retention-time information (Form VII)
4. Quantitation-limit standard (Form VII-Z)
5. GPC calibration (Form IX)

Section VII **Other Raw Data**

1. Percent moisture for soil samples
2. Sample extraction and cleanup logs
3. Instrument analysis log for each instrument used (Form VIII-Z)
4. Standard preparation logs, including initial and final concentrations for each standard used
5. Formula and a sample calculation for the initial calibration
6. Formula and a sample calculation for soil sample results

Requirements for Full Data Packages -- Inorganic Analysis

Sections I, II, III **Summary Package**

Section IV **Instrument Raw Data –** Sequential measurement readout records for ICP, graphite furnace atomic absorption (GFAA), flame atomic absorption (AA), cold vapor mercury, cyanide, and other inorganic analyses, which will contain the following information:

1. Environmental samples, including dilutions and re-analysis
2. Initial calibration
3. Initial and continuing calibration verifications
4. Detection limit standards
5. Method blanks, continuing calibration blanks, and preparation blanks
6. ICP interference check samples
7. MS and post-digestion spikes
8. Sample duplicates
9. LCSs
10. Method of standard additions
11. ICP serial dilution

Section V **Other Raw Data**

1. Percent moisture for soil samples
2. Sample digestion, distillation, and preparation logs, as necessary
3. Instrument analysis log for each instrument used
4. Standard preparation logs, including initial and final concentrations for each standard used
5. Formula and a sample calculation for the initial calibration
6. Formula and a sample calculation for soil sample results

1.6.5 Reports Generated

A remedial investigation report for the Tidal Area sites will be prepared at the conclusion of the field work and laboratory analysis. The report will include a comprehensive summary of the results of previous related investigations and field and sampling procedures for all sampling conducted at the site as part of the RI, including the data gaps sampling and analysis proposed in this SAP. The human health risk assessment and all previous sections of the former RI will be updated to incorporate the results of the additional sampling described in this SAP. In addition, the ecological risk assessment, which was formerly issued as a separate document, will be incorporated directly into the revised RI, either as an appendix or as a separate chapter. The revised RI will include updated conclusions and recommendations for each site.

2.0 DATA GENERATION AND ACQUISITION

This section describes the requirements for the following:

- Sampling Process Design (Section 2.1)
- Sampling Methods (Section 2.2)
- Sample Handling and Custody (Section 2.3)
- Analytical Methods (Section 2.4)
- Quality Control (Section 2.5)
- Equipment Testing, Inspection, and Maintenance (Section 2.6)
- Instrument Calibration and Frequency (Section 2.7)
- Inspection and Acceptance of Supplies and Consumables (Section 2.8)
- Non-Direct Measurements (Section 2.9)
- Data Management (Section 2.10)

2.1 SAMPLING PROCESS DESIGN

The following subsections discuss the sample design of the data gaps sampling proposed in this SAP. The number of samples and description of locations are presented in Section 1.1.2 of this SAP.

2.1.1 Pesticides at Froid and Taylor Roads, Site 9

The sampling locations proposed to investigate the pesticide data gap at the Site 9 are described in Section 1.1.2.1 of this SAP. The design of the sampling program at this location is intended to evaluate the presence of pesticides in the vicinity of former sample location FTSSL102 and, if confirmed, to add data to the data set regarding the nature and extent of pesticides present. The proposed sample spacing and number of samples are based on professional judgment and discussions held with agency personnel on May 14, 2004.

2.1.2 Mercury in Wood Hogger, Site 11

The sampling locations proposed to investigate the mercury data gap at Site 11 are described in Section 1.1.2.2 of this SAP. The design of the sampling program at this location is intended to evaluate the nature and extent of mercury at the southwestern corner of the Site 11, particularly within Otter Slough and on the banks of Otter Slough.

Analytical results for mercury based on samples collected to date in the area are highly variable. In addition to the sampling proposed along the nine transects, confirmation samples are also proposed in the immediate vicinity of samples collected previously that exhibited the highest concentrations. These samples are intended to confirm the high concentrations previously detected and to evaluate the variability in mercury concentrations in that portion of the site.

The proposed sample spacing and number of samples are intended to define the nature and extent of mercury contamination at the site. The proposed sampling pattern is biased to evaluate conditions near Otter Slough and near locations of former samples that contained elevated concentrations of mercury. The sample design is based on professional judgment and discussions held with agency personnel on May 14, 2004.

Although the proposed sample design will provide data to evaluate the nature and extent of contamination, the sample design has not been developed to enable detailed statistical analysis of the data set. A larger number of samples would be necessary to generate a data set appropriate for detailed statistical analysis.

2.1.3 Rationale for Selecting Analytical Parameters

The rationale for addressing each data gap and the analytical suite selected as a results are presented in the following paragraphs and in Table 7.

Pesticides were selected for sampling and analysis at Site 9 because the previous concentrations detected at sample location FTSSL102 exceeded the ER-Ms. No other data gaps have been identified at Site 9.

Mercury was selected for sampling and analysis because four previous samples in the southwestern corner of Site 11 contain concentrations mercury in excess of the ER-M. No other data gaps have been identified at Site 11.

TABLE 7: PROPOSED DATA GAP SAMPLES, RATIONALE, AND ANALYSES
Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Location Name	Analyses	Sample Identification No.	Sample Depth	Rationale
Four locations, see Figure 3	Pesticides	See Section 2.3.1	Surface Sediment	Step-out samples to confirm presence of pesticides near FTSSL102
See Section 2.3.1 see Figures 4 and 5	Mercury	See Section 2.3.1	Surface to 24 inches	Samples to evaluate nature and extent of mercury near Otter Slough
Four locations, see Figure 6	Mercury	See Section 2.3.1	Surface Sediment	Step-out samples to confirm presence of mercury at 4 locations where mercury exceeds the ER-M

2.1.4 Surveying

A professional land surveyor, licensed by the State of California, will survey the elevation of ground surface at each sample location to a precision of 0.10 foot and its horizontal location to 0.1 foot. The elevations will be surveyed relative to the 1929 National Geodetic Vertical Datum (1929 NGVD). The horizontal locations will be surveyed using the 1927 North American Datum (1927 NAD).

2.1.5 Underground Utilities Clearance

Underground utilities will be cleared by a utility locating contractor before any intrusive activities begin. The survey will include water distribution piping, telecommunications lines, storm sewer lines, sanitary sewer lines, industrial wastewater lines, gas lines, fire fighting water lines, fuel product lines, and electrical lines.

2.1.6 Munitions and Explosives of Concern

The entire Tidal Area is located within an area potentially containing munitions and explosives of concern (MEC) as a result of the explosion at the munitions handling docks in 1944. Consequently, the locations for all intrusive sampling proposed in this SAP must be investigated and cleared for potential MEC using magnetometer screening before sample collection begins.

2.2 SAMPLING METHODS

This section describes the procedures for sample collection, including sampling methods and equipment, sample preservation requirements, decontamination procedures, and management of investigation-derived waste (IDW).

2.2.1 Sampling Methods and Equipment

A "split spoon" tubular steel split barrel sampling device will be used to collect surface and subsurface sediment samples from 0 to 24 inches bgs. Samples may be collected by stainless-steel scoop or trowel at locations where only the surface will be sampled. A representative sample will be collected, immediately transferred to an appropriate container, and chilled. The procedures for collection of sediments using either of these methods are described in detail in Tetra Tech SOP 006 (Appendix E).

2.2.2 Decontamination

It is expected that disposable equipment will be used to collect surface sediment samples; therefore, no equipment decontamination will be required. The possibility exists that this disposable equipment will not be effective in Otter Slough. If non-disposable equipment is required, any equipment that may come in contact with sample media will be decontaminated following the practices listed in Tetra Tech SOP 002 "General Equipment Decontamination" (Appendix E). Nondisposable sampling equipment will be decontaminated before and after collecting each sediment sample for analysis. All water derived from decontamination will be collected and temporarily stored on site for characterization as IDW.

2.2.3 Management of Investigation-Derived Waste

IDW that will be generated during this investigation includes wastewater from decontamination and equipment rinsate procedures. The wastewater will be containerized in drums. One IDW water sample will be collected from the drum of liquid IDW. After the IDW sample is analyzed and the results are received, the waste will be disposed of properly.

Additional IDW generated as a result of soil sampling will include disposable PPE. Disposable PPE will be managed according to the level of contamination encountered during field activities. In general, PPE will be managed as nonhazardous solid waste, particularly if little contact occurs with the sampling medium and low levels of contaminants are involved. PPE will be placed in plastic bags and, if the results for IDW indicate that it is nonhazardous, the bags will transferred to an on-site industrial dumpster, whose contents are routinely disposed in a municipal landfill.

2.2.4 Sample Containers and Holding Times

The type of sample containers to be used for each analysis, the sample volumes required, the preservation requirements, and the maximum holding times for samples prior to extraction and analysis are presented in Table 8, Protocol for Sample Collection.

TABLE 8: PROTOCOL FOR SAMPLE COLLECTION

Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Analysis	Method	Matrix	Holding Time (From Date Sampled)	Container	Preservative
Pesticides	EPA 8081A	Sediment	14 days to extraction 40 days to analysis	240-mL glass	Cool, 4C
Mercury	EPA 7471A	Sediment	28 days	240-mL glass	Cool, 4C
Pesticides	EPA 8081A	IDW and Equipment Rinse Water	14 days to extraction 40 days to analysis	1-Liter amber glass	Cool, 4C
Mercury	EPA 7471A	IDW and Equipment Rinse Water	28 days	500 mL polyethylene	Cool, 4C

Notes:

C Centigrade
EPA U.S. Environmental Protection Agency
mL Milliliter

2.3 SAMPLE HANDLING AND CUSTODY

The sections below describe sample handling procedures, including sample identification and labeling, documentation, chain of custody, and shipping.

2.3.1 Sample Identification

A unique sample identification number will be assigned to each sample collected during this project. The sample identification numbering system is designed to be compatible with a computerized data management system that includes previous results for samples collected at this installation. The sample numbering system allows each sample to be uniquely identified and provides a means of tracking the sample from collection through analysis. The numbering system indicates the DO and site numbers, the sampling type, and the location number. The numbering scheme is illustrated below.

Site 9

Location ID	**Sample ID**
See Figure 3	Same as Location ID

Site 11 at Otter Slough

(location and sample ID numbers include transect number (see Figure 4) and sample location on the transect as well as depth (see Figure 5):

Location ID	Sample ID
WHS001A through WHS001E	Same as Location ID plus 0, 8, or 16 indicating sample depth
WHS002A through WHS002E	Same as Location ID plus 0, 8, or 16 indicating sample depth
WHS003A through WHS003E	Same as Location ID plus 0, 8, or 16 indicating sample depth
WHS004A through WHS004E	Same as Location ID plus 0, 8, or 16 indicating sample depth
WHS005A through WHS005E	Same as Location ID plus 0, 8, or 16 indicating sample depth
WHS006A through WHS006E	Same as Location ID plus 0, 8, or 16 indicating sample depth
WHS007A through WHS007E	Same as Location ID plus 0, 8, or 16 indicating sample depth
WHS008A through WHS008E	Same as Location ID plus 0, 8, or 16 indicating sample depth
WHS009A through WHS009E	Same as Location ID plus 0, 8, or 16 indicating sample depth
WHS0010A through WHS0010E	Same as Location ID plus 0, 8, or 16 indicating sample depth

Site 11 at Otter Slough

Location ID	Sample ID
See Figure 6	Same as Location ID

2.3.2 Sample Labels

A sample label will be affixed to all sample containers. The label will be completed with the following information, written in indelible ink:

- Project name and location
- Sample identification number
- Date and time of sample collection
- Preservative used
- Sample collector's initials
- Analysis required

After it is labeled, each sample will be refrigerated or placed in a cooler that contains wet ice to maintain the sample temperature at or below 4 degrees Celsius.

2.3.3 Sample Documentation

Documentation during sampling is essential to ensure proper sample identification. Tetra Tech personnel will adhere to the following general guidelines for maintaining field documentation:

- Documentation will be completed in permanent black ink
- All entries will be legible
- Errors will be corrected by crossing out with a single line and then dating and initialing the lineout
- Any serialized documents will be maintained at Tetra Tech and referenced in the site logbook
- Unused portions of pages will be crossed out, and each page will be signed and dated

Section 1.6.1 includes additional information on how Tetra Tech will use logbooks to document field activities. The field team leader (FTL) is responsible for ensuring that sampling activities are properly documented.

2.3.4 Chain-of-Custody

The contractor will use standard sample custody procedures to maintain and document sample integrity during collection, transportation, storage, and analysis. A sample will be considered to be in custody if one of the following statements applies:

- It is in a person's physical possession or view.
- It is in a secure area with restricted access.
- It is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal.

Chain-of-custody procedures provide an accurate written record that traces the possession of individual samples from the time of collection in the field to the time of acceptance at the laboratory. The chain-of-custody record (Appendix F) also will be used to document all samples collected and the analysis requested. Information that the field personnel will record on the chain-of-custody record includes:

- Project name and number
- Sampling location
- Name and signature of sampler
- Destination of samples (laboratory name)
- Sample identification number
- Date and time of collection
- Number and type of containers filled
- Analyses requested
- Preservatives used (if applicable)

- Filtering (if applicable)
- Sample designation (grab or composite)
- Sample media
- Signatures of individuals involved in custody transfer, including the date and time of transfer
- Airbill number (if applicable)
- Project contact and phone number

Unused lines on the chain-of-custody record will be crossed out. Field personnel will sign chain-of-custody records that are initiated in the field, and the airbill number will be recorded. The record will be placed in a waterproof plastic bag and taped to the inside of the shipping container used to transport the samples. Signed airbills will serve as evidence of custody transfer between field personnel and the courier, and between the courier and the laboratory. Copies of the chain-of-custody record and the airbill will be retained and filed by field personnel before the containers are shipped.

Laboratory chain of custody begins when samples are received and continues until samples are discarded. Laboratories analyzing samples must follow custody procedures at least as stringent as are required by the EPA CLP SOWs (EPA 1999b, 2000a). The laboratory should designate a specific individual as the sample custodian. The custodian will receive all incoming samples, sign the accompanying custody forms, and retain copies of the forms as permanent records. The laboratory sample custodian will record all pertinent information concerning the samples, including the persons who delivered the samples, the date and time they were received, condition of the sample at the time it was received (sealed, unsealed, or broken container; temperature; or other relevant remarks), the sample identification numbers, and any unique laboratory identification numbers for the samples. This information should be entered into a computerized LIMS. When the sample transfer process is complete, the custodian is responsible for maintaining internal logbooks, tracking reports, and other records necessary to maintain custody throughout sample preparation and analysis.

The laboratory will provide a secure storage area for all samples. Access to this area will be restricted to authorized personnel. The custodian will ensure that samples that require special handling, including samples that are heat- or light-sensitive, radioactive, or have other unusual physical characteristics, will be properly stored and maintained prior to analysis.

2.3.5 Sample Shipment

The following procedures will be implemented when samples collected during this project are shipped:

- The chain-of-custody records will be placed inside a plastic bag. The bag will be sealed and taped to the inside of the shipping container. The airbill, if required, will be filled out before the samples are handed over to the carrier. The laboratory will be notified if the sampler suspects that the sample contains any substance that would require laboratory personnel to take safety precautions.
- The shipping container will be closed and taped shut with strapping tape around both ends. If the shipping container has a drain, it will be taped shut both inside and outside of the shipping container.
- Signed and dated custody seals will be placed on the front and side of each shipping container. Wide clear tape will be placed over the seals to prevent accidental breakage.
- The chain-of-custody record will be transported within the taped sealed shipping container. When the shipping container is received at the analytical laboratory, laboratory personnel will open the shipping container and sign the chain-of-custody record to document transfer of samples.

Multiple shipping containers may be sent in one shipment to the laboratory. The outside of the shipping container will be marked to indicate the number of shipping container in the shipment.

2.4 ANALYTICAL METHODS

Sample methods, volume, preservation, and holding time requirements for these methods are specified in Table 8. Appendix A documents the PRRL for this project. Appendix B includes project-specific precision and accuracy goals for the methods.

The analytical laboratories will attempt to achieve the PRRLs for all the investigative samples collected. If problems occur in achieving the PRRLs, the laboratories will contact the contractor analytical coordinator immediately, and other alternatives will be pursued (such as analyzing an undiluted aliquot and allowing nontarget compound peaks to go off scale) to achieve acceptable reporting limits. In addition, results below the reporting limit but above the MDL will be reported with appropriate flags to indicate the greater uncertainty associated with these values.

Protocols for laboratory selection and for ensuring laboratory compliance with project analytical and QA/QC requirements are presented in the following sections.

2.4.1 Selection of Analytical Laboratories

Laboratories for this investigation will be selected from a list of prequalified laboratories developed by Tetra Tech to support Navy contracts. Prequalification streamlines laboratory selection by reducing the need to compile and review detailed bid and qualification packages for each individual investigation. Prequalification also improves flexibility in the program by allowing analyses to be directed to a number of different capable laboratories with available capacity at the time samples are collected.

Tetra Tech's laboratory prequalification and selection process relies on (1) a standard procedure to evaluate and prequalify laboratories for work under the contract, and (2) the "Tetra Tech EM Inc. Laboratory Analytical Statement of Work" for Navy contracts (Tetra Tech 2002), a contractual document that specifies standard requirements for analyses that are routinely conducted. Tetra Tech establishes a basic ordering agreement that incorporates and enforces the laboratory SOW with each prequalified laboratory. Individual purchase orders can then be written for specific investigations. These aspects of laboratory selection are further described in the following sections, along with Tetra Tech's procedures for selecting laboratories when the laboratory SOW does not specifically address project-specific analytical methods or QC requirements.

2.4.1.1 Laboratory Evaluation and Prequalification

Laboratories that support the Navy either directly or through subcontracts are evaluated and approved for Navy use by the Naval Facilities Engineering Service Center (NFESC). Laboratories that support Tetra Tech under Navy contracts have been selected from the list of laboratories approved by NFESC. They further have been evaluated by Tetra Tech to assure that the laboratory can meet the technical requirements of the laboratory SOW and produce data of acceptable quality. The laboratories are evaluated in accordance with the NFESC *Installation Restoration Chemical Data Quality Manual* (IRCDQM) (NFESC 1999). The laboratory evaluation includes the following elements:

- **Certification and Approval.** Laboratories must be currently certified by the California Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP) for analysis of hazardous materials for each method specified. Laboratories must also have or obtain similar approval from NFESC. The California DHS ELAP certification and NFESC approval must be obtained before the laboratory begins work.

- **Performance Evaluation (PE) Samples.** Each laboratory must initially and yearly demonstrate its ability to satisfactorily analyze single-blind PE samples for all analytical services it will provide under Navy contracts. At its discretion, Tetra Tech may submit one or more double-blind PE samples at Tetra Tech's cost. When the results for the PE sample are deficient, the laboratory must correct any problems and analyze (at its own cost) a subsequent round of PE samples for the deficient analysis.

- **Audits.** Laboratories must initially and yearly demonstrate their qualifications by submitting to one or more audits by Tetra Tech. The audits may consist of (1) an on-site review of laboratory facilities, personnel, documentation, and procedures, or (2) an off-site review of hardcopy and electronic deliverables, or magnetic tapes. When deficiencies are identified, the laboratory must correct the problem and provide Tetra Tech with a written summary of the corrective action that was taken.

Appendix G provides a current list of subcontractor laboratories that have passed this evaluation program. Each laboratory was evaluated before it was added to the list, and each is reevaluated annually. If a laboratory fails to meet any of the evaluation criteria, it is removed from the list of approved laboratories.

2.4.1.2 Laboratory Statement of Work

The laboratory SOW establishes standard requirements for the analytical methods that are most commonly used under Navy contracts. For each method, the laboratory SOW specifies standard method-specific target analyte lists and PRRLs; QC samples and associated control limits; calibration requirements; and miscellaneous method performance requirements. The laboratory SOW also specifies requirements for standard data packages, formats for electronic data deliverables, data qualifiers, and delivery schedules. In addition, the laboratory SOW outlines support services (such as providing sample containers, trip blanks, temperature blanks, sample coolers, and custody forms and seals) that are expected of laboratories. The laboratory SOW incorporates Navy QA policy, as well as applicable EPA and state QA guidelines, as appropriate.

Tetra Tech's laboratory SOW is based on EPA CLP methods for volatile organic compounds, semivolatile organic compounds, pesticides, polychlorinated biphenyls, metals, and cyanide. The laboratory SOW also addresses frequently used non-CLP methods for a variety of organic, inorganic, and physical parameters. Non-CLP methods include the methods published by EPA in SW-846 (EPA 1986) and in "Methods for Chemical Analysis of Water and Waste" (MCAWW) (EPA 1983); American Society for Testing and Materials (ASTM, now ASTM International) methods; and those published by the American Public Health Association, American Water Works Association, and Water Pollution Control Federation in "Standard Methods for the Examination of Water and Waste Water (American Water Works Association 1999)." Laboratories on Tetra Tech's approved laboratory list can elect to provide all or a portion of the analytical services specified in the laboratory SOW.

As noted above, the laboratory SOW is incorporated into all laboratory subcontracts established for analytical services supporting Navy projects. Thus, the prequalified laboratories commit to meeting the requirements in the laboratory SOW during the contracting process before they receive samples. Tetra Tech reviews and revises the laboratory SOW regularly to incorporate new methods and requirements, modifications or updates to existing methods, changes in Navy QA policy or regulatory requirements, and any other necessary corrections or revisions.

2.4.1.3 Laboratory Selection and Oversight

After project-specific analytical and QA/QC requirements have been identified and documented in the SAP, the Tetra Tech analytical coordinator works closely with a Tetra Tech procurement specialist to select a laboratory that can meet these requirements. When project-specific analytical and QC requirements are consistent with Tetra Tech's laboratory SOW, the analytical coordinator identifies one or more prequalified subcontractor laboratories that are capable of carrying out the work. As part of this process, the analytical coordinator typically contacts the laboratories to discuss the analytical requirements and project schedule. The analytical coordinator then forwards the name of the recommended laboratory (or laboratories) to the Tetra Tech procurement specialist, who issues a purchase order for the work. When analytical requirements are consistent with Tetra Tech's laboratory SOW and multiple prequalified laboratories are capable of performing the work, a specific laboratory is typically selected based on workload and project schedule considerations.

Tetra Tech follows a similar procedure when project-specific analytical and QC requirements are nonstandard and differ from Tetra Tech's laboratory SOW. The analytical coordinator contacts analytical laboratories, beginning with Tetra Tech's prequalified list, to discuss the analytical and QA/QC requirements in the SAP and to assess the laboratories' ability to meet the requirements. In many cases, Tetra Tech works cooperatively with analytical laboratories to develop and refine appropriate QC requirements for nonstandard analyses or matrixes.

Additional laboratories are contacted if the analytical coordinator is unable to identify one or more prequalified laboratories that can accept the work. In general, the additional laboratories must be evaluated as described in Section 2.4.1.1 before they will be allowed to analyze any samples, although some steps in the evaluation may be waived for certain investigations and circumstances (for example, unusual analytes, urgent project needs, experimental methods, mobile laboratories, or on-site screening analyses). After additional laboratories have been identified, the analytical coordinator forwards their names to the procurement specialist. The procurement specialist prepares a solicitation package, including the project-specific analytical and QC requirements, and submits the package to the laboratories. The procurement specialist, in cooperation with the analytical coordinator and project manager, then evaluates the proposals that are received and selects a laboratory that meets the requirements and provides the best value to the Navy and Tetra Tech. Finally, the procurement specialist issues a purchase order to the selected laboratory that incorporates the project-specific analytical and QA/QC requirements.

After a laboratory has been selected, the analytical coordinator holds a kickoff meeting with the laboratory project manager. The kickoff meeting is held regardless of whether project-specific analytical and QA/QC requirements are consistent with Tetra Tech's laboratory SOW or are outside the SOW. The Tetra Tech project manager, procurement specialist, and other key project and laboratory staff may also be involved in this meeting. The kickoff meeting includes a review of analytical and QC requirements in the SAP, the project schedule, and any other logistical support that the laboratory will be expected to provide.

2.4.2 Project Analytical Requirements

One or more prequalified subcontractor laboratories will analyze samples off site for this investigation. The laboratories will be selected before the field program begins based on their ability to meet the project analytical and QC requirements, as well as their ability to meet the project schedule. The analytical methods selected for this investigation standard EPA methods that are described in Tetra Tech's laboratory SOW.

This SAP documents project-specific QC requirements for the analytical methods selected. Sample volume, preservation, and holding time requirements are specified in Table 8. Requirements for laboratory QC samples are described in Table 4 and in Section 2.5. PRRLs for each method are documented in Appendix A. Appendix B includes project-specific precision and accuracy goals for the methods.

2.5 QUALITY CONTROL

The precision and accuracy of the chemical measurements of samples will be assessed through a combination of field and laboratory QC samples. Field QC samples and laboratory QC samples are discussed in the following sections.

2.5.1 Laboratory Quality Control Samples

The following types of laboratory QC samples will be used for this investigation:

- **Method blanks** will be prepared at the frequency prescribed in the individual analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method.

- **LCS** will be analyzed at the frequency prescribed in the analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. If percent recovery results for the LCS or blank spike are outside of the established goals, laboratory-specific protocols will be followed to determine the usability of the data.

- **Surrogate standards** consist of known concentrations of nontarget organic analytes that are added to each sample and method blank before samples are prepared and analyzed. The surrogate standard measures the efficiency of the analytical method in recovering the target analytes from an environmental sample matrix. Percent recoveries for surrogate compounds are evaluated using laboratory control limits. Surrogate standards provide an indication of laboratory accuracy and matrix effects for every field and QC sample that is analyzed by GC for volatile and extractable organic constituents.

2.5.1.1 Additional Laboratory QC Procedures

In addition to the analysis of laboratory QC samples, subcontractor laboratories will conduct the QC procedures discussed below.

- **MDL studies** determine the minimum concentration of a compound that can be measured and reported. The MDL is a specified limit at which there is 99 percent confidence that the concentration of the analyte is greater than zero. The MDL accounts for sample matrix and preparation. The subcontractor laboratory will demonstrate the MDLs for all air analyses. MDL studies will be conducted annually for soil matrices, or more frequently if any method or instrumentation changes. Each MDL study will consist of seven replicates spiked with all target analytes of interest at concentrations no greater than the required quantitation limits. The replicates will be extracted and analyzed in the same manner as the routine samples. If multiple instruments are used, each will be included in the MDL study. The MDLs reported will be representative of the least sensitive instrument.

- **Sample quantitation limits** (SQL) or practical quantitation limits, are PRRLs adjusted for the characteristics of individual samples. The PRRL is usually defined in the analytical method or in laboratory method documentation. The SQL accounts for changes in preparation and analytical methodology that may alter the ability to detect an analyte, including changes such as use of a smaller sample aliquot or dilution of the sample extract. Physical characteristics such as sample matrix and percent moisture that may alter the ability to detect the analyte are also considered. The laboratory will calculate and report SQLs for all environmental samples.

- **Control charts** document data quality in graphic form for specific method parameters such as surrogate standards and blank spike recoveries. A collection of data points for each parameter is used to statistically calculate means and control limits for a given analytical method. This information is useful in evaluating whether analytical measurement systems are in control. In addition, control charts provide information about trends over time in specific analytical and preparation methodologies. Control charts are recommended for organic analyses. At a minimum, method blank surrogate recoveries and blank spike recoveries should be charted for all organic methods. Control charts should be updated monthly.

2.5.2 Field Quality Control Samples

QC samples are collected in the field and analyzed to check sampling and analytical precision, accuracy, and representativeness. The following section discusses the types and purposes of field QC samples that will be collected for this project. Table 9 provides a summary of the types and frequency of collection of field QC samples.

TABLE 9: FIELD QC SAMPLES
Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Sample Type	Frequency of Analysis	Matrix
Source Water Blank	1 per source of water used for the final decontamination rinse	Water
Equipment Rinsate	1 per day[a]	Water

Notes:

Field QC samples will only be collected if non-disposable sampling equipment is required.

a Tetra Tech anticipates one soil sampling event.

2.5.2.1 Field Duplicates

Field duplicate samples are collected at the same time and from the same source and then submitted as separate samples to the laboratory for analysis.

Although field duplicate soil samples are sometimes collected as soil samples from adjacent locations, such soil duplicate samples will not be collected for this project for two reasons. First, since adjacent soil samples incorporate some spatial variability, these samples cannot be used directly to assess sampling precision. Further, it is not practical to set QC limits for the RPD of such samples, which precludes the use of these samples for QC purposes. Second, while the spatial variability information that can be obtained from adjacent soil samples may be useful in assessing or implementing remedial options, no objectives relating to these data uses have been identified for this project. Rather, it has been determined that this type of spatial variability information will be obtained during subsequent investigations at this site, if required.

2.5.2.2 Equipment Rinsate Samples

Equipment rinsate samples demonstrate whether decontamination procedures are effective in removing contaminants from the field sampling equipment. The presence of contamination in equipment rinsate samples indicates that cleaning procedures were not effective, allowing for the possibility of cross-contamination. Equipment rinsate samples will be collected during soil sampling at a frequency of once per day of sampling. An equipment rinsate is a sample collected after a sampling device is subjected to standard decontamination procedures. Water will be poured over or through the sampling equipment into a sample container and sent to the laboratory for analysis. Analytically certified, organic-free water will be used for organic parameters; deionized or distilled water will be used for inorganic parameters.

Equipment rinsate samples will be sent blind to the laboratory. During data validation, the results for the equipment rinsate samples will be used to qualify data or to evaluate the levels of analytes in the field samples collected on the same day.

2.5.2.3 Source Water Blank Samples

One source water blank will be collected of the water used for the final decontamination rinse. Tetra Tech anticipates using only one source of water for the final decontamination rinse. The source water blank will be analyzed for all project analytes.

2.6 EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

This section outlines the testing, inspection, and maintenance procedures that will be used to keep both field and laboratory equipment in good working condition.

2.6.1 Maintenance of Field Equipment

Preventive maintenance for most field equipment is carried out in accordance with procedures and schedules recommended in the equipment manufacturer's literature or operating manual. However, more stringent testing, inspection, and maintenance procedures and schedules may be required when field equipment is used to make critical measurements.

A field instrument that is out of order will be segregated, clearly marked, and not used until it is repaired. The FTL will be notified of equipment malfunctions so that service can be completed quickly or substitute equipment can be obtained. Unscheduled testing, inspection, and maintenance should be conducted when the condition of equipment is suspect. Any significant problems with field equipment will be reported in the daily field QC report.

2.6.2 Maintenance of Laboratory Equipment

Subcontractor laboratories will prepare and follow a maintenance schedule for each instrument used to analyze samples collected for this investigation. All instruments will be serviced at scheduled intervals necessary to optimize factory specifications. Routine preventive maintenance and major repairs will be documented in a maintenance logbook.

An inventory of items to be kept ready for use in case of instrument failure will be maintained and restocked as needed. The list will include equipment parts subject to frequent failure, parts that have a limited lifetime of optimum performance, and parts that cannot be obtained in a timely manner.

The laboratory's QA plan and written SOPs will describe specific preventive maintenance procedures for equipment maintained by the laboratory. These documents identify the personnel responsible for major, preventive, and daily maintenance procedures; the frequency and type of maintenance performed; and procedures for documenting maintenance.

Laboratory equipment malfunctions will require immediate corrective action. Actions should be documented in laboratory logbooks. No other formal documentation is required unless data quality is adversely affected or further corrective action is necessary. On-the-spot corrective actions will be taken as necessary in accordance with the procedures described in the laboratory QA plan and SOPs.

2.7 INSTRUMENT CALIBRATION AND FREQUENCY

Field equipment, if used, will be calibrated at the beginning of the field effort and at prescribed intervals. The calibration frequency depends on the type and stability of equipment, the intended use of the equipment, and the recommendation of the manufacturer. All calibration information will be recorded in a field logbook or on field forms. A label that specifies the scheduled date of the next calibration will be attached to the field equipment. If this type of identification is not feasible, equipment calibration records will be readily available for reference.

2.8 INSPECTION AND ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Tetra Tech project managers have primary responsibility for identifying the types and quantities of supplies and consumables needed to complete Navy projects and are responsible for establishing acceptance criteria for these items.

Supplies and consumables can be received either at the Tetra Tech office or at the site. When supplies are received, the project manager or FTL will sort them according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before they are accepted for use on a project. If an item does not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order, and the item will then be returned to the vendor for replacement or repair.

Procedures for receiving supplies and consumables in the field are similar. Analytical laboratories are required to provide certified clean containers for all analyses. These containers must meet EPA standards described in "Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers" (EPA 1992).

2.9 NONDIRECT MEASUREMENTS

No data for project implementation or decision-making will be obtained from nondirect measurements.

2.10 DATA MANAGEMENT

Field and analytical data collected from this project and other environmental investigations at NWS SBD Concord are critical to site characterization efforts, development of the comprehensive conceptual site model, risk assessments, and selection of remedial actions to protect human health and the environment. An information management system is necessary to ensure efficient access so that decisions based on the data can be made in a timely manner.

After the field and laboratory data reports are reviewed and validated, the data will be entered into Tetra Tech's database for NWS SBD Concord. The database contains data for (1) summarizing observations on contamination and geologic conditions, (2) preparing reports and graphics, (3) using with geographic information systems (GIS), and (4) transmitting in an electronic format compatible with NEDTS. The following sections describe Tetra Tech's data tracking procedures, data pathways, and overall data management strategy for NWS SBD Concord.

2.10.1 Data Tracking Procedures

All data that are generated in support of the Navy program at NWS SBD Concord are tracked through a database created by Tetra Tech. Information related to the receipt and delivery of samples, project order fulfillment, and invoicing for laboratory and validation tasks is stored in the Tetra Tech program, SAMTRAK. All data are filed according to the document control number.

2.10.2 Data Pathways

Data are generated from three primary pathways at NWS SBD Concord: data derived from field activities, laboratory analytical data, and validated data. Data from all three pathways must be entered into the database for NWS SBD Concord. Data pathways must be established and well documented to evaluate whether the data have been accurately loaded into the database in a timely manner.

Data generated during field activities are recorded using field forms (Appendix D). The analytical coordinator or field team leader reviews these forms for completeness and accuracy. Data from the field forms, including the chain-of-custody form, are entered into SAMTRAK according to the document control number.

Data generated during laboratory analysis are recorded in hardcopy and in EDDs after the samples have been analyzed. The laboratory sends the hardcopy and EDD records to the analytical coordinator. The analytical coordinator reviews the data deliverable for completeness, accuracy, and format. After the format has been approved, the electronic data are manipulated and downloaded into the database for NWS SBD Concord. Tetra Tech data entry personnel then updates SAMTRAK with the total number of samples received and number of days required to receive the data.

After validation, the analytical coordinator reviews the data for accuracy. Tetra Tech then updates the database for NWS SBD Concord with the appropriate data qualifiers. SAMTRAK is also updated to record associated laboratory and data validation costs.

2.10.3 Data Management Strategy

Tetra Tech's short- and mid-term data management strategies require that the database for NWS SBD Concord be updated monthly. The data consist of chemical and field data from Navy contractors, entered into an Oracle (Version 7.3) database. The database can be used to generate reports using available computer-aided drafting and design and contouring software. All electronic data from this database will be stored and maintained in a format compatible with NEDTS.

To satisfy long-term data management goals, the data will be loaded into the database at Tetra Tech for storage, further manipulation, and retrieval after laboratory and field reports are reviewed and validated. The database will be used to provide data for chemical and geologic analysis and for preparing reports and graphic representations of the data. Additional data acquired from field activities are recorded on field forms (Appendix D) that are reviewed for completeness and accuracy by the analytical coordinator or field team leader. Hard copies of forms, data, and chain-of-custody forms are filed in a secure storage area according to project and document control numbers. Laboratory data packages and reports will be archived at Tetra Tech or Navy offices. Laboratories that generated the data will archive hardcopy data for a minimum of 10 years.

3.0 ASSESSMENT AND OVERSIGHT

This section describes the field and laboratory assessments that may be conducted during this project, the individuals responsible for conducting assessments, corrective actions that may be implemented in response to assessment results, and how quality-related issues will be reported to Tetra Tech and Navy management.

3.1 ASSESSMENT AND RESPONSE ACTIONS

Tetra Tech and the Navy will oversee collection of environmental data using the assessment and audit activities described below. Any problems encountered during an assessment of field investigation or laboratory activities will require appropriate corrective action to ensure that the problems are resolved. This section describes the types of assessments that may be completed, Tetra Tech and Navy responsibilities for conducting the assessments, and corrective action procedures to address problems identified during an assessment.

3.1.1 Field Assessments

Tetra Tech conducts field technical systems audits (TSA) on selected Navy projects to support data quality and encourage continuous improvement in the field systems that involve environmental data collection. The Tetra Tech QA program manager selects projects for field TSAs quarterly based on available resources and the relative significance of the field sampling effort. During the field TSA, the assessor will use personnel interviews, direct observations, and reviews of project-specific documentation to evaluate and document whether procedures specified in the approved SAP are being implemented. Specific items that may be observed during the TSA include:

- Availability of approved project plans such as the SAP and HASP
- Documentation of personnel qualifications and training
- Sample collection, identification, preservation, handling, and shipping procedures
- Sampling equipment decontamination
- Equipment calibration and maintenance

- Completeness of logbooks and other field records (including nonconformance documentation)

During the TSA, the Tetra Tech assessor will verbally communicate any significant deficiencies to the FTL for immediate correction. These and all other observations and comments will also be documented in a TSA report. The TSA report will be issued to the Tetra Tech project manager, FTL, program QA manager, and project QA officer in e-mail format within 7 days after the TSA is completed.

The Tetra Tech program QA manager determines the timing and duration of TSAs. Generally, TSAs are conducted early in the project so that any quality issues can be resolved before large amounts of data are collected.

The Navy QA officer may also independently conduct a field assessment of any Tetra Tech project. Items reviewed by the Navy QA officer during a field assessment may be similar to those described above.

3.1.2 Laboratory Assessments

As described in Section 2.4.1, NFESC assesses all laboratories before they are allowed to analyze samples under Navy contracts. Tetra Tech also conducts a pre-award assessment of each laboratory before they are placed on the approved list for performing work under Navy contracts (Appendix G). These assessments include (1) reviews of laboratory certifications, (2) initial and annual demonstrations of the laboratory's ability to satisfactorily analyze single-blind PE samples, and (3) laboratory audits. Laboratory audits may consist of an on-site review of laboratory facilities, personnel, documentation, and procedures, or an off-site evaluation of the ability of the laboratory's data management system to meet contract requirements. Tetra Tech also conducts an assessment when an approved laboratory has been selected for nonroutine analyses or when a laboratory that is not on the approved list must be used.

The Navy may audit any laboratory that will analyze samples on this project. The Navy QA officer will determine the need for these audits and typically will conduct the audits before samples are submitted to the laboratory for analysis.

3.1.3 Assessment Responsibilities

Tetra Tech personnel who conduct assessments will be independent of the activity evaluated. The Tetra Tech program QA manager will select the appropriate personnel to conduct each assessment and will assign them responsibilities and deadlines for completing the assessment. These personnel may include the program QA manager, project QA officer, or senior technical staff with relevant expertise and experience in assessment.

When an assessment is planned, the Tetra Tech program QA manager selects a lead assessor who is responsible for:

- Selecting and preparing the assessment team
- Preparing an assessment plan
- Coordinating and scheduling the assessment with the project team, subcontractor, or other organization being evaluated
- Participating in the assessment
- Coordinating preparation and issuance of assessment reports and corrective action request forms
- Evaluating responses and resulting corrective actions.

After a TSA is completed, the lead assessor will submit an audit report to the Tetra Tech program QA manger, project manager, and project QA officer; other personnel may be included in the distribution as appropriate. Findings from the assessment will also be included in the quality control summary report for the project (Section 3.2.3).

The Navy QA officer is responsible for coordinating all audits that may be conducted by Navy personnel under this project. Audit preparation, completion, and reporting responsibilities for Navy auditors would be similar to those described above.

3.1.4 Field Corrective Action Procedures

Field corrective action procedures will depend on the type and severity of the finding. Tetra Tech classifies assessment findings as either deficiencies or observations. Deficiencies are findings that may have a significant impact on data quality and that will require corrective action. Observations are findings that do not directly affect data quality, but are suggestions for consideration and review.

As described in Section 3.1.1, project teams are required to respond to deficiencies identified in TSA reports. The project manager, FTL, and project QA officer will discuss the deficiencies and the appropriate steps to resolve each deficiency by:

- Determining when and how the problem developed
- Assigning responsibility for problem investigation and documentation
- Selecting the corrective action to eliminate the problem
- Developing a schedule for completing the corrective action
- Assigning responsibility for implementing the corrective action
- Documenting and verifying that the corrective action has eliminated the problem
- Notifying the Navy of the problem and the corrective action taken

In responding to the TSA report, the project team will include a brief description of each deficiency, the proposed corrective action, the individual responsible for selecting and implementing the corrective action, and the completion dates for each corrective action. The project QA officer will use a status report to monitor all corrective actions.

The Tetra Tech program QA manager is responsible for reviewing proposed corrective actions and verifying that they have been effectively implemented. The program QA manager can require data acquisition to be limited or discontinued until the corrective action is complete and a deficiency is eliminated. The program QA manager can also request the reanalysis of any or all samples and a review of all data acquired since the system was last in control.

3.1.5 Laboratory Corrective Action Procedures

Internal laboratory procedures for corrective action and descriptions of out-of-control situations that require corrective action are contained in laboratory QA plans. At a minimum, corrective action will be implemented when any of the following three conditions occurs: control limits are exceeded, method QC requirements are not met, or sample holding times are exceeded. The laboratory will report out-of-control situations to the Tetra Tech analytical coordinator within 2 working days after they are identified. In addition, the laboratory project manager will prepare and submit a corrective action report to the Tetra Tech analytical coordinator. This report will identify the out-of-control situation and the steps that the laboratory has taken to rectify it.

3.2 REPORTS TO MANAGEMENT

Effective management of environmental data collection requires (1) timely assessment and review of all activities, and (2) open communication, interaction, and feedback among all project participants. Tetra Tech will use the reports described below to address any project-specific quality issues and to facilitate timely communication of these issues.

3.2.1 Daily Progress Reports

Tetra Tech will prepare a daily progress report to summarize activities throughout the field investigation. This report will describe sampling and field measurements, equipment used, Tetra Tech and subcontractor personnel on site, QA/QC and health and safety activities, problems encountered, corrective actions taken, deviations from the SAP, and explanations for the deviations. The daily progress report is prepared by the field team leader and submitted to the project manager and to the Navy remedial project manager (RPM), if requested. The content of the daily reports will be summarized and included in the final report submitted for the field investigation.

3.2.2 Project Monthly Status Report

The Tetra Tech project manager will prepare a monthly status report (MSR) to be submitted to the Tetra Tech's program manager and the Navy RPM. Monthly status reports address project-specific quality issues and facilitate their timely communication. The MSR will include the following quality-related information:

- Project status
- Instrument, equipment, or procedural problems that affect quality and recommended solutions
- Objectives from the previous report that were achieved
- Objectives from the previous report that were not achieved
- Work planned for the next month

If appropriate, Tetra Tech will obtain similar information from subcontractors who are participating in the project and will incorporate the information within the MSR.

3.2.3 Quality Control Summary Report

Tetra Tech will prepare a QC summary report (QCSR) that will be submitted to the Navy RPM with the final report for the field investigation. The QCSR will include a summary and evaluation of QA/QC, including any field or laboratory assessments, completed during the investigation. The QCSR will also indicate the location and duration of storage for the complete data packages. Particular emphasis will be placed on determining whether project DQOs were met and whether data are of adequate quality to support required decisions.

4.0 DATA VALIDATION AND USABILITY

This section describes the procedures that are planned to review, verify, and validate field and laboratory data. This section also discusses procedures for verifying that the data are sufficient to meet DQOs and MQOs for the project.

4.1 DATA REVIEW, VERIFICATION, AND VALIDATION

Validation and verification of the data generated during field and laboratory activities are essential to obtaining defensible data of acceptable quality. Verification and validation methods for field and laboratory activities are presented below.

4.1.1 Field Data Verification

Project team personnel will verify field data through reviews of data sets to identify inconsistencies or anomalous values. Any inconsistencies discovered will be resolved as soon as possible by seeking clarification from field personnel responsible for data collection. All field personnel will be responsible for following the sampling and documentation procedures described in this SAP so that defensible and justifiable data are obtained.

Data values that are significantly different from the population are called "outliers." A systematic effort will be made to identify any outliers or errors before field personnel report the data. Outliers can result from improper sampling or measurement methodology, data transcription errors, calculation errors, or natural causes. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in sampling, measurement, transcription, or calculation will be clearly identified in project reports.

4.1.2 Laboratory Data Verification

Laboratory personnel will verify analytical data at the time of analysis and reporting and through subsequent reviews of the raw data for any nonconformances to the requirements of the analytical method. Laboratory personnel will make a systematic effort to identify any outliers or errors before they report the data. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in analysis, transcription, or calculation will be clearly identified in the case narrative section of the analytical data package.

4.1.3 Laboratory Data Validation

An independent third-party contractor will validate all laboratory data in accordance with current EPA national functional guidelines (EPA 1994, 1999c). The data validation strategy will be consistent with Navy guidelines. For this project, 100 percent of the data will undergo cursory validation and 20 percent of the data will undergo full validation. Requirements for cursory and full validation are listed below.

4.1.3.1 Cursory Data Validation

Cursory validation will be completed on 100 percent of the summary data packages received. The data reviewer is required to notify Tetra Tech and request any missing information needed from the laboratory. Elimination of the data from the review process is not allowed. All data will be qualified as necessary in accordance with established criteria. Data summary packages will consist of sample results and QC summaries, including calibration and internal standard data.

4.1.3.2 Full Data Validation

Full validation will be completed on 20 percent of the full data packages received. The data reviewer is required to notify Tetra Tech and request any missing information needed from the laboratory. Elimination of data from the review process is not allowed. All data will continue through the validation process and will be qualified in accordance with established criteria. Data summary packages will consist of sample results, QC summaries, and all raw data associated with the sample results and QC summaries.

4.1.3.3 Data Validation Criteria

Table 10 lists the data validation QC criteria that will be reviewed for both cursory and full data validation. The data validation criteria selected from Table 10 will be consistent with the project-specific analytical methods referenced in Section 2.4 of the SAP.

4.2 RECONCILIATION WITH USER REQUIREMENTS

After environmental data have been reviewed, verified, and validated in accordance with the procedures described in Section 4.1, the data must be further evaluated to determine whether DQOs have been met.

To the extent possible, Tetra Tech will follow EPA's data quality assessment (DQA) process to verify that the type, quality, and quantity of data collected are appropriate for their intended use. DQA methods and procedures are outlined in EPA's "Guidance for Data Quality Assessment, Practical Methods for Data Analysis" (EPA 2000c). The DQA process includes five steps: (1) review the DQOs and sampling design; (2) conduct a preliminary data review; (3) select a statistical test; (4) verify the assumptions of the statistical test; and (5) draw conclusions from the data.

TABLE 10: DATA VALIDATION CRITERIA
Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Analytical Parameter Group	Cursory Data Validation Criteria	Full Data Validation Criteria
Non-CLP Organic Analyses	Method compliance Holding times Calibration Blanks Surrogate recovery Laboratory control sample or blank spike Field duplicate sample analysis Other laboratory QC specified by the method Overall assessment of data for an SDG	Method compliance Holding times Calibration Blanks Surrogate recovery Laboratory control sample or blank spike Compound identification Detection limits Compound quantitation Sample results verification Other laboratory QC specified by the method Overall assessment of data for an SDG

Notes:

CLP Contract Laboratory Program
QC Quality control
SDG Sample delivery group

When the five-step DQA process is not completely followed because the DQOs are qualitative, Tetra Tech will systematically assess data quality and data usability. This assessment will include:

- A review of the sampling design and sampling methods to verify that they were implemented as planned and are adequate to support project objectives
- A review of project-specific data quality indicators for precision, accuracy, representativeness, completeness, comparability, and quantitation limits (defined in Section 1.3.2) to determine whether acceptance criteria have been met
- A review of project-specific DQOs to determine whether they have been achieved by the data collected
- An evaluation of any limitations associated with the decisions to be made based on the data collected. For example, if data completeness is only 90 percent compared with a project-specific completeness objective of 95 percent, the data may still be usable to support a decision, but at a lower level of confidence.

The final report for the project will discuss any potential impacts of these reviews on data usability and will clearly define any limitations associated with the data.

REFERENCES

American Water Works Association. 1999. “Standard Methods for the Examination of Water and Wastewater, 20th Edition.” January

California Air Resources Board (CARB). 1986. “Testing Guidelines for Active Solid Waste Disposal Sites.”

Ecology and Environment (E&E). 1983. “Initial Assessment Study, Naval Weapons Station Concord, California.” June.

IT Corporation (IT). 1992. “Draft, Site Investigation Report, Tidal Area Sites, Naval Weapons Station, Concord, CA.” July.

Long, E.R., and D.D. MacDonald. 1998. “Recommended Uses of Empirically Derived, Sediment Quality Guidelines for Marine and Estuarine Ecosystems.” *Human and Ecological Risk Assessment*. Volume 4. Number 5. Pages 1,019-1,039.

Long, E.R. and L.G. Morgan. 1990. “The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52. US National Oceanic and Atmospheric Administration, Seattle, Washington, 175 pp.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. “Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments.” *Environmental Management.* Volume 19, Number 1. Pages 81-97

Long, E.R., and D.D. MacDonald. 1998. “Recommended Uses of Empirically Derived, Sediment Quality Guidelines for Marine and Estuarine Ecosystems.” *Human and Ecological Risk Assessment*. Volume 4, Number 5.

Naval Facilities Engineering Service Center (NFESC). 1999. “Navy Installation Restoration Chemical Data Quality Manual (IRCDQM).” Special Report SP-2056-ENV. September.

Occupational Safety and Health Administration (OSHA). 2003. “U.S. Department of Labor Occupational Safety and Health Administration, Permissible Exposure Limits.” Available Online at: http://www.osha.gov/SLTC/pel. July.

PRC and Montgomery Watson (MW). 1993. “Tidal Area Landfill Confirmation Sampling Study, Naval Weapons Station, Concord, California.”

PRC Environmental Management, Inc. (PRC). 1994. “Draft Final Work Plan, Volume I, Remedial Investigation/Feasibility Study [RI/FS] Tidal Area Sites, Naval Weapons Station Concord, California.” December.

PRC. 1995. “RI/FS Tidal Area Sites Draft Final Work Plan, Volume II (QEA), Naval Weapons Station Concord, California.” February.

PRC Environmental Management, Inc. (PRC). 1997. "Final Report, RCRA Facility Assessment Confirmation Study, Naval Weapons Station, Concord, California." Document Listing Information: Filing Code 003.06, Bar Code D000037618, Contract Task Order 044-0009. August 3.

Tetra Tech EM Inc. (Tetra Tech). 1998. "Technical Memorandum: Confirmation Groundwater Sampling in the Tidal Area Sites - Naval Weapons Station, Concord, California." March 19.

Tetra Tech. 2002. "Tetra Tech EM Inc. Laboratory Analytical Statement of Work." January.

Tetra Tech. 2003. "Revised Draft Final Remedial Investigation, Tidal Area Sites 2, 9, and 11, Naval Weapons Station Concord, California." (Now considered a draft document based on agreement between U.S. EPA and the Navy.)

Tetra Tech. 2004. "Final Record of Decision, Tidal Area Landfill Naval Weapons Station Seal Beach Detachment Concord, California." March

U.S. Environmental Protection Agency (EPA). 1983. "Methods for chemical analyses of water and wastes." Cincinnati, OH. EPA-600/4-79-020.

EPA. 1986. "Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition." Cincinnati, Ohio. (revised December 1996)

EPA. 1992. "Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers." OSWER Directive No. 9240.0-05A. April.

EPA. 1993. "Presumptive Remedy for CERCLA Municipal Landfill Sites." EPA 540/F-93/035. September.

EPA. 1994. "National Functional Guidelines for Inorganic Data Review." Office of Emergency and Remedial Response. Washington, DC. EPA-540/R-94/013. February.

EPA. 1999a. "Compendium Method TO-15, Determination of Volatile Organic Compounds in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)." January.

EPA. 1999b. "U.S. EPA Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration." Document Number OLM04.2. May.

EPA. 1999c. "National Functional Guidelines for Organic Data Review." Office of Emergency and Remedial Response. Washington, DC. EPA-540/R-99-008. October.

EPA. 2000a. "U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration." Document Number ILM04.1. January.

EPA. 2000b. "Data Quality Objectives Process for Hazardous Waste Site Investigations (EPA QA/ G-4HW)." Office of Environmental Information. Washington, D.C. EPA/600/R-00/007. January.

EPA. 2000c. "Guidance for Data Quality Assessment, Practical Methods for Data Analysis, EPA QA/ G-9, QA00 Update." Office of Environmental Information. Washington, D.C. EPA/600/ R-96-084. July.

EPA. 2000d. "Guidance for the Data Quality Objectives Process, EPA QA/G-4." Office of Environmental Information. Washington, DC. EPA/600/R-96/055. August.

EPA. 2001. "EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5." Office of Environmental Information. Washington, DC. EPA/240/B-01/003. March.

Western Ecological Services Company (WESCO). 1995. "Qualitative Habitat Characterization Report, Tidal Area Sites, Naval Weapons Station Concord, California (Draft)." Prepared for PRC. March.

APPENDIX A
PROJECT-REQUIRED REPORTING LIMITS

TABLE A-1: ANALYTICAL REPORTING LIMITS

Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Analyte	PRRL	ER-M	PRRL Meets ER-M (Yes/No)?
Metals (mg/kg)			
Mercury	0.20	0.71	Yes
Pesticides (µg/kg)			
alpha-Chlordane	3	6	Yes
gamma-Chlordane	3	6	Yes
4, 4'-DDT	6	7	Yes
Total DDTs	NA	46.1	NA

Notes:

µg/kg Micrograms per kilogram (parts per billion)
ER-M Effects range-median
mg/kg Milligram per kilogram (parts per million)
PRRL Project-required reporting limit

APPENDIX B
METHOD PRECISION AND ACCURACY GOALS

TABLE B-1: PRECISION AND ACCURACY GOALS

Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Analyte	Sediment	
	% Recovery	RPD
Metals		
Mercury	70 to 130	35
Pesticides		
Spike Compound		
Dichlorodiphenyltrichloroethane	83 to 127	20
Surrogate Compounds		
Tetrachlorometaxylene	84 to 138	NA
Decachlorobiphenyl	59 to 113	NA

Notes:

NA Not applicable
RPD Relative percent difference

APPENDIX C
SITE-SPECIFIC HEALTH AND SAFETY PLAN (SHORT FORM) AND SAFE WORK PRACTICES – WORKING OVER OR NEAR WATER

Site Name: Concord Naval Weapons Station	**Site Contact:** John Bosche	**Telephone:** (415) 222-8295
Location: Tidal Area Sites 2, 9, and 11	**Client Contact:** Steve Tyahla	**Telephone:** (650) 746-7451
EPA I.D. No.: Not applicable	**Prepared By:** John Bosche	**Date:** June 2004
Project No. G1058.3.4.01.106.05	**Date of Proposed Activities:** Spring 2005	

Objectives:
All personnel working on this site must be trained in accordance with 29 CFR 1910.120 and must have medical clearance to work on a hazardous waste site.

The objective of this short form health and safety plan (HASP) is to list the site-specific hazards and the hazards controls to be used to ensure worker safety for the activities described below.

Site Type: *Check as many as applicable.*

☐ Active	☒ Industrial Waste	☐ Well field
☒ Inactive	☐ Landfill	☐ Underground storage tank
☒ Secure	☐ Confined space **(must use long form)**	☐ Unknown **(must use long form)**
☐ Unsecure	☐ Uncontrolled Waste **(must use long form)**	☐ Other *(specify)* __________

Site Description/History and Site Activities:

The objective of the scope of work is to evaluate previously identified data gaps in the Tidal Area sites by collecting surface soil samples, and surface sediment samples. The soil or sediment samples from Site 9 will be analyzed for pesticides. Soil or sediment samples from the Site 11 and Otter Slough areas will be analyzed for mercury.

The Tidal Area at Naval Weapons Station Seal Beach Detachment (NWS SBD) Concord is located within an area suspected of containing munitions and explosives of concern (MEC) as a result of an explosion in 1944 at the munitions handling docks. Collection of soil or sediment samples will be contingent on an evaluation of munitions and explosives of concern (MEC) at the site. Health and safety considerations associated with the clearing of the sample collection sites for MEC is not detailed in this HASP but will be covered in a separate health and safety plan addressing potential MEC at the sites.

Note: A site map, definitions, and additional information are provided on the last three pages of this form.

Waste Management Practices:

The Tidal Area Sites were proposed for no further action by the Navy based on the lack of risk to human health and the environment. Although data gaps were identified by the agencies and are the subject of the proposed sampling, risks to human health and the environment do not clearly trigger the need for action at the site. For example, carcinogenic risks to human health under residential exposure assumptions do not exceed 1 x 10^{-4} and but are greater than 1x 10^{-6}. The risk to human health lies within the target risk range for the resident. Based on the results of the remedial investigation (RI), no waste management practices have been specifically identified that would pose unacceptable risk to human health.

Sample Media: ☒ Liquid ☒ Solid ☐ Sludge ☐ Gas

Waste / Chemical Characteristics:

☐ Corrosive ☐ Oxidizer ☐ Flammable
☒ Toxic ☒ Explosive ☒ Volatile ☐ Radioactive
☐ Reactive ☐ Inert ☐ Other *(specify)* ________________________

Chemical / Health Hazards of Concern:

☐ Explosion or fire hazard – monitor with combustible gas meter
☐ Oxygen deficiency – monitor with oxygen meter
☐ Landfill gases – monitor with methane and hydrogen sulfide meter
☐ Surface tanks
☐ Potential inhalation or skin absorption hazard that is immediately dangerous to life and health (IDLH) – **must use long form**
☒ Inorganic chemicals (mercury)
☒ Organic chemicals (pesticides)
☐ Petroleum Hydrocarbons
☐ Underground storage tanks
☐ Other *(specify)* ________________________

Explosion or Fire Potential: ☐ High ☐ Medium ☒ Low ☐ Unknown

Radiological Hazards of Concern:

- ☐ Ionizing radiation (Radioactive materials, X-ray) **(must use long form)**
- ☐ Non-ionizing radiation (ultraviolet, lasers)

Safety Hazards of Concern: (Based on anticipated clean-up operations)

- ☐ Heavy equipment
- ☐ Pinch points
- ☐ Energized and rotating equipment (drill rig)
- ☐ Steam cleaning equipment
- ☐ Excavations
- ☐ Welding or torch cutting (hot work)
- ☐ Sharp objects
- ☐ Hazardous energy sources (electrical, hydraulic)
- ☐ Buried utilities
- ☐ Overhead utilities
- ☐ Suspended loads
- ☐ Buried drums
- ☒ Work over or near water (refer to Safe Work Practice # 6-05)
- ☐ Work from elevated platforms
- ☐ Manual lifting
- ☐ Other *(specify)* ______________________________

Physical Hazards of Concern:

- ☒ Heat stress
- ☐ Cold stress
- ☒ Slips, trips, falls on dry land and in a marine environment
- ☐ Illumination
- ☐ Vibration
- ☐ Noise
- ☒ Solar (sunburn)
- ☒ Unstable or steep terrain
- ☒ Other *(specify)* MEC. Must be checked prior to fieldwork

Biological Hazards of Concern:

- ☐ Poisonous plants (poison ivy, poison oak)
- ☐ Spiders (black widow or brown recluse spiders)
- ☐ Medical waste
- ☐ Snakes (rattlesnakes)
- ☐ Stinging insects (bees, wasps)
- ☐ Animals (feral dogs, mountain lions, etc.)
- ☐ Blood or other body fluids

Unexploded Ordnance:

- ☐ Unexploded Ordnance (UXO) **(must use long form)**
- ☐ Chemical Warfare Materials (CWM) **(must use long form)**
- ☐ Explosive ordnance waste (OEW) **(must use long form)**
- ☒ MEC evaluated under separate health and safety plan

Chemical Products Tetra Tech EMI Will Use or Store On Site: (Attach a Material Safety Data Sheet [MSDS] for each item.)

☒ Alconox® or Liquinox®

☐ Hydrochloric acid (HCl)

☐ Nitric Acid (HNO_3)

☐ Sodium hydroxide (NaOH)

☐ Sulfuric Acid (H_2SO_4)

☐ Other *(specify)* ____________________________________

☐ Other *(specify)* ____________________________________

☐ Other *(specify)* ____________________________________

☐ Other *(specify)* ____________________________________

☐ Other *(specify)* ____________________________________

☐ Other *(specify)* ____________________________________

Chemicals Present at Site	Highest Observed Concentration (specify units and media)	PEL/TLV (specify ppm or mg/m^3)	IDLH Level (specify ppm or mg/m^3)	Symptoms and Effects of Acute Exposure	Photoionization Potential (eV)
Alpha chlordane	11 ug/kg	PEL = 0.5 mg/m^3 TLV = 0.5 mg/m^3	100 mg/m^3	Readily absorbed through the skin Acute: Causes convulsions; irritating to skin, eyes, and mucous membranes; Chronic: May cause damage to lungs, liver, and kidneys	NA
Gamma chlordane	12 ug/kg	PEL = 0.5 mg/m^3 TLV = 0.5 mg/m^3	100 mg/m^3	Readily absorbed through the skin Acute: Causes convulsions; irritating to skin, eyes, and mucous membranes; Chronic: May cause damage to lungs, liver, and kidneys	NA
DDT	15 ug/kg	PEL = 1 mg/m^3 TLV = 1 mg/m^3	500 mg/m^3	Readily absorbed through the skin Acute: Irritating to skin, eyes, and mucous membranes, affects the central nervous system; causes convulsions Chronic: Causes cancer in animals (possible human carcinogen); may cause damage to liver and kidneys	NA
Mercury (as alkyl mercury; e.g. methyl mercury)	18.5 mg/kg	PEL = 0.01 mg/m^3 TLV = 0.01 mg/m^3	2 mg/m^3	Readily absorbed through the skin Acute: Cause dysfunction of the central nervous system and kidneys; irritant of eyes, mucous membranes and skin; numbness and tingling of lips, hands, and feet; coordination, difficulty speaking, impairment of hearing, and emotional disturbances Chronic: Produces developmental effects in humans	NA

CARC = Carcinogenic	IDLH = Immediately dangerous to life or health	NE = Not established	STEL = Short term exposure limit
CNS = Central nervous system	mg/m^3 = Milligram per cubic meter	PEL = Permissible exposure limit	TLV = Threshold limit value
eV = Electron volt	NA = Not applicable	ppm = Part per million	U = Unknown

Field Activities Covered Under This Plan:

Task Description [1]	**Type**	**Level of Protection: Primary**		**Level of Protection: Contingency**		**Date of Activities**
1 Collect surface sediment and surface soil samples at NWS SBD Concord Tidal Area sites and in Otter Slough	☒ Intrusive ☐ Nonintrusive	☐ C	☒ D	☐ C	☐ D	2005
2 Collect sediment samples in Otter Slough from a boat or while standing at the bottom of the slough during low tide	☐ Intrusive ☒ Nonintrusive	☐ C	☒ D	☐ C	☐ D	2005

Site Personnel and Responsibilities (include subcontractors):

Employee Name and Office Code	**Task**	**Responsibilities**
John Bosche, SF	1	Program Manager or Designated Leader: Directs project investigation activities, makes site safety coordinator (SSC) aware of pertinent project developments and plans, and maintains communications with client as necessary.
To be determined	1	SSC: Ensures that appropriate personal protective equipment (PPE) is available, enforces proper utilization of PPE by on-site personnel, suspends investigative work if he or she believes that site personnel are or may be exposed to an immediate health hazard, implements the health and safety plan, and reports any observed deviations from anticipated conditions described in the health and safety plan to the health and safety representative.
To be determined	1	Field Personnel: Complete tasks as directed by the program manager, field team leader, and SSC and follow all procedures and guidelines established in the Tetra Tech EMI Health and Safety Manual.
To be determined	1	Alternate SSC: See above

[1] **Make copies of this page if more than 2 tasks are anticipated for the project.**

Protective Equipment: (Indicate type or material as necessary for each task; attach additional sheets as necessary)

Task: ☒ 1 ☐ 2		Task: ☐ 1 ☒ 2	
Level: ☐ C ☒ D		Level: ☐ C ☒ D	
☒ Primary	☐ Contingency	☒ Primary	☐ Contingency
RESPIRATORY	PROTECTIVE CLOTHING	RESPIRATORY	PROTECTIVE CLOTHING
☒ Not needed	☒ Not needed	☒ Not needed	☒ Not needed
☐ APR: ______	☐ Tyvek® coveralls: ______	☐ APR: ______	☐ Tyvek® coveralls: ______
☐ Cartridge: ______	☐ Saranex® coveralls: ______	☐ Cartridge: ______	☐ Saranex® coveralls: ______
☐ Escape mask: ______	☐ Coveralls: ______	☐ Escape mask: ______	☐ Coveralls: ______
☐ Other: ______	☐ Other: ______	☐ Other: ______	☐ Other: ______
HEAD AND EYE	GLOVES	HEAD AND EYE	GLOVES
☐ Not needed	☐ Not needed	☐ Not needed	☐ Not needed
☒ Safety glasses: ______	☐ Undergloves: ______	☒ Safety glasses: ______	☐ Undergloves: ______
☐ Face shield: ______	☒ Gloves: Nitrile	☐ Face shield: ______	☒ Gloves: Nitrile
☐ Goggles: ______	☐ Overgloves: ______	☐ Goggles: ______	☐ Overgloves: ______
☒ Hard hat: ______		☒ Hard hat: ______	
☐ Other: ______		☐ Other: ______	
FIRST AID EQUIPMENT	BOOTS	FIRST AID EQUIPMENT	BOOTS
☐ Not needed	☐ Not needed	☐ Not needed	☐ Not needed
☒ Standard First Aid kit	☒ Work boots: Steel-Toe/Steel	☒ Standard First Aid kit	☒ Work boots: Steel-Toe/Steel
☐ Portable eyewash	☐ Overboots: ______	☐ Portable eyewash	☐ Overboots: ______
OTHER		OTHER	
☐ (specify): ______		☒ (specify): Lifejacket	

Note: APR = Air purifying respirator

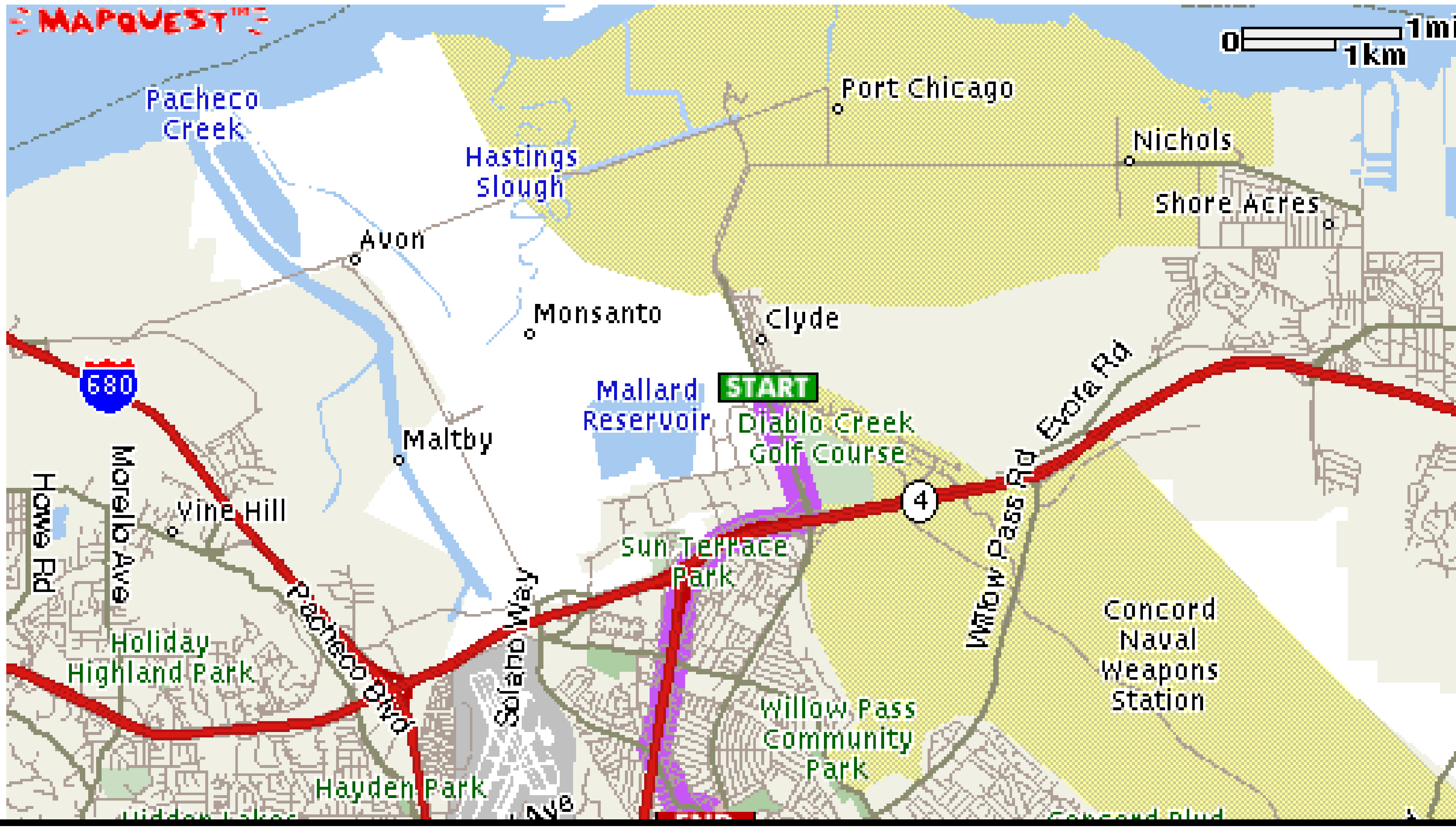
Monitoring Equipment: (Specify instruments needed for each task; attach additional sheets as necessary)				
Instrument	Task	Instrument Reading	Action Guideline	Comments
Combustible gas indicator model: Lantec® Gem 500 or equivalent	☐ 1	0 to 10% LEL	No explosion hazard	☒ Not needed
	☐ 2	10 to 25% LEL	Potential explosion hazard; notify SSC	
		> 25% LEL	Explosion hazard; interrupt task; evacuate immediate area, notify SSC	
O_2 meter model: Lantec® Gem 500 or equivalent	☐ 1	> 23.5% O_2	Potential fire hazard; evacuate immediate area	☒ Not needed
	☐ 2	23.5 to 19.5% O_2	Oxygen level normal	
		< 19.5% O_2	Oxygen deficiency; interrupt task; evacuate immediate area; notify SSC	
Photoionization detector model: ☐ 11.7 eV ☐ 10.6 eV ☐ 9.8 eV ☐ _____eV	☐ 1	0 to 2 ppm above background	Level D	☒ Not needed
	☐ 2	>2 to 100 ppm above background	Level C	
		>100 ppm above background	Evacuate immediate area; notify SSC	
Flame ionization detector model:	☐ 1	>0 to 5 ppm above background	Level D	☒ Not needed
	☐ 2	>5 to 50 ppm above background	Level C	
		>50 ppm above background	Evacuate site; notify SSC	
Respirable dust monitor model:	☐ 1 ☐ 2	Specify:	Specify:	☒ Not needed
Other: (specify):	☐ 1 ☐ 2			☒ Not needed

Notes:
eV = Electron volt
O_2 = Oxygen
LEL = Lower explosive limit
ppm = Part per million
SSC = Site safety coordinator

Additional Comments:	Emergency Contacts: Telephone
Tetra Tech EMI site workers will contain and absorb any chemicals used or transferred on site.	U.S. Coast Guard National Response Center (800) 424-8802 InfoTrac (800) 535-5053 Fire department 911 Police department 911 Tetra Tech EMI Personnel: Corporate Human Resource Manager: Norman Endlich (703) 390-0626 Corporate Health & Safety Manager: Judith Wagner (847) 818-7192 Office Health & Safety Coordinator: Will Warren (415) 222-8293 Program Manager: John Bosche (415) 222-8295 Site Safety Coordinator: To be determined
Personnel Decontamination and Disposal Method:	**Medical Emergency:**
Personnel will follow the U.S. Environmental Protection Agency's "Standard Operating Safety Guides" for decontamination procedures for Level D personal protection (with modified Level C contingency). The following decontamination stations should be set up in each decontamination zone: • Segregated equipment drop • Boot and glove wash and rinse • Disposable glove, bootie, and coverall removal and segregation station • Safety glasses and hard hat removal station • Hand and face wash and rinse If site conditions require upgrade to Level C, a station must be set up for respirator removal, respirator decontamination, and cartridge disposal. All disposable equipment, clothing, and wash water will be double-bagged or containerized in an acceptable manner and disposed of in accordance with local regulations.	Hospital Name: Mount Diablo Medical Hospital Hospital Address: 2540 East St, Concord, CA Hospital Telephone: Emergency - 911 General – (925) 682-8200 Ambulance Telephone: 911 Route to Hospital: (see next page for route map) 1. Exit NWSSBD Concord and go South on PORT CHICAGO HWY 2. Take the CA-4 W ramp toward RICHMOND. 3. Merge onto CA-242 S toward OAKLAND/CONCORD. 1.6 miles 4. Take the SOLANO WAY exit toward GRANT ST. 0.1 miles 5. Take the ramp toward GRANT ST. <0.1 miles 6. Turn LEFT onto SOLANO WAY. <0.1 miles 7. SOLANO WAY becomes GRANT ST. 0.5 miles 8. Turn SHARP LEFT onto EAST ST. <0.1 miles End at 2540 EAST ST CONCORD CA

Note: This page must be posted on site.

Hospital Route Map (if available):



Note: This page must be posted on site.

APPROVAL AND SIGN-OFF FORM

Project No. G1058.3.4.01.106.05

I have read, understood, and agree with the information set forth in this Health and Safety Plan and will follow the direction of the Site Safety Coordinator as well as procedures and guidelines established in the Tetra Tech EMI Health and Safety Manual. I understand the training and medical requirements for conducting field work and have met these requirements.

Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date

APPROVALS: (Two Signatures Required)

Site Safety Coordinator	Date
Program Manager or Designee	Date

DEFINITIONS

Intrusive - Work involving excavation to any depth, drilling, opening of monitoring wells, most sampling, and Geoprobe® work

Nonintrusive - Generally refers to site walk-throughs or field reconnaissance

Levels of Protection

Level D – Hard hat, safety boots, and glasses, may include protective clothing such as gloves, boot covers, and Tyvek® or Saranex® coveralls

Level C – Hard hat, safety boots, glasses, and air purifying respirators with appropriate cartridges, **PLUS** protective clothing such as gloves, boot covers, and Tyvek® or Saranex® coveralls

Emergency Contacts

InfoTrac – For issues related to incidents involving the transportation of hazardous chemicals; this hotline provides accident assistance 24 hours per day, 7 days per week

U.S. Coast Guard National Response Center – For issues related to spill containment, cleanup, and damage assessment; this hotline will direct spill information to the appropriate state or region

Health and Safety Plan Short Form

- Used for field projects of limited duration and with relatively limited activities; may be filled in with handwritten text
- Limitations:
  - No Level B or A work
  - Limited number of tasks
  - No confined space entry
  - No unexploded ordnance work or radiation hazard

TETRA TECH EM, INC.

HEALTH AND SAFETY MANUAL

VOLUME III

SAFE WORK PRACTICES (SWP)

WORKING OVER OR NEAR WATER

SWP NO.: 6-5

ISSUE DATE: JULY 1998

REVISION NO.: 1

1.0 WORKING OVER OR NEAR WATER

This safe work practice (SWP) provides guidelines for working over or near bodies of water 3 or more feet deep or swiftly moving water. Workers will observe the requirements of the Occupational Safety and Health Administration (OSHA) specified in Title 29 of the *Code of Federal Regulations* (CFR), Part 1926.106, "Working Over or Near Water." The following sections discuss general procedures, underwater work, and cold water procedures.

2.0 GENERAL PROCEDURES

When working over or near water, the following precautions will be taken:

- All staff and team members must wear a personal flotation device (PFD) within 15 feet of a water body. Personnel will be provided with U.S. Coast Guard (USCG)-approved life jackets or work vests. The PFD should be Class III, which will support the head of an unconscious person above water.
- Life jackets and work vests will be inspected before each use.
- A USCG-approved life-saving skiff will be available.
- Under no circumstances will team members enter water bodies without protective clothing such as rubber boots or waders.
- At least one person will remain on shore as a look-out.

If a team member falls into the water, under no circumstances should another team member enter the water to rescue the person in the water. If possible, a branch, paddle, pole, or similar object should be extended to the person in the water. When the person in the water grabs the extended item, they should be pulled toward the shore or boat. If the person is unconscious, the PFD, clothing, or hair should be hooked to pull the person toward the shore or boat. Once the person has been safely retrieved, necessary emergency medical procedures should be performed by qualified personnel. If none are necessary, the retrieved team member should change into dry clothing as soon as possible after any necessary personal decontamination.

3.0 UNDERWATER WORK

Underwater work should be performed in accordance with the procedures and guidelines of the Diving Safety Program (Document Control No. 2-15 in Volume I).

4.0 COLD WATER PROCEDURES

When the water temperature is below 45 °F, hypothermia is a serious risk. A person can lose feeling in the extremities within 5 minutes. All field staff members should be familiar with cold water survival techniques or should receive training from an American Red Cross-certified swimming instructor in cold water survival techniques when site conditions warrant such knowledge.

After a person has been rescued from cold water, he or she should change into dry clothes as soon as possible. If the person who has fallen into the water displays hypothermia symptoms, he or she should be treated immediately and taken to a medical facility. Under no circumstances should the hypothermia victim be given hot liquids because this could accelerate shock. Drinks no warmer than normal body temperature are acceptable. If symptoms are severe and evacuation to a medical facility cannot be quickly conducted, any wet clothing should be removed, the victim should be placed in blankets or sleeping bags in a sheltered location, and the rescuer should climb into the blankets or sleeping bag with victim to provide additional warmth. The victim should also be treated continuously for shock, elevating feet and monitoring the victim's pulse and breathing rate.

If a team member falls into cold water, he or she should not remove any clothing while in the water because clothing provides additional insulation. Although clothing creates an added drag while swimming, the insulation outweighs the disadvantage of the additional drag. Each team member should carry a wool hat to place on his or her head in case he or she falls into the water. A wool hat, even when wet, provides good insulation for the head, where a large amount of body heat is lost.

APPENDIX D
FIELD FORMS

Tetra Tech EM Inc.
135 Main Street, Suite 1800
San Francisco, CA 94105
(415) 543-4880

Daily Tailgate Safety Meeting Form

Date: ______________________ Time: ______________ Job Number: __________

Client: ______________________ Site Location: __________________________________

Scope of Work: ____

Safety Topics Presented

Planned Field Activities for the Day: ____

____

Protective Clothing/Equipment: ____

____

Chemical Hazards: ____

____

Physical Hazards: ____

____

Special Equipment: ____

____

Decontamination Procedures: ____

____

Other: ____

____

Emergency Procedures: ____

____

Hospital: ______________ Phone: __________ Ambulance Phone: ________________

Hospital Address and Route: ____

Employee Questions/Comments: ____

Attendees

Name (Printed)	Signature

Meeting Conducted By:

____

Name (Printed) / Signature   Name (Printed) / Signature

____

Site Safety Coordinator   Project Field Manager

APPENDIX E
STANDARD OPERATING PROCEDURES

SOP APPROVAL FORM

TETRA TECH EM INC.

ENVIRONMENTAL STANDARD OPERATING PROCEDURE

GENERAL EQUIPMENT DECONTAMINATION

SOP NO. 002

REVISION NO. 2

Last Reviewed: December 1999

	February 2, 1993
Quality Assurance Approved	Date

1.0 BACKGROUND

All nondisposable field equipment must be decontaminated before and after each use at each sampling location to obtain representative samples and to reduce the possibility of cross-contamination.

1.1 PURPOSE

This standard operating procedure (SOP) establishes the requirements and procedures for decontaminating equipment in the field.

1.2 SCOPE

This SOP applies to decontaminating general nondisposable field equipment. To prevent contamination of samples, all sampling equipment must be thoroughly cleaned prior to each use.

1.3 DEFINITIONS

Alconox: Nonphosphate soap

1.4 REFERENCES

U.S. Environmental Protection Agency (EPA). 1992. "RCRA Ground-Water Monitoring: Draft Technical Guidance. Office of Solid Waste. Washington, DC. EPA/530-R-93-001. November.

EPA. 1994. "Sampling Equipment Decontamination." Environmental Response Team SOP #2006 (Rev. #0.0, 08/11/94). On-Line Address: http://204.46.140.12/media_resrcs/media_resrcs.asp?Child1=

1.5 REQUIREMENTS AND RESOURCES

The equipment required to conduct decontamination is as follows:

- Scrub brushes
- Large wash tubs or buckets
- Squirt bottles

- Alconox
- Tap water
- Distilled water
- Plastic sheeting
- Aluminum foil
- Methanol or hexane
- Dilute (0.1 N) nitric acid

2.0 PROCEDURE

The procedures below discuss decontamination of personal protective equipment (PPE), drilling and monitoring well installation equipment, borehole soil sampling equipment, water level measurement equipment, and general sampling equipment.

2.1 PERSONAL PROTECTIVE EQUIPMENT DECONTAMINATION

Personnel working in the field are required to follow specific procedures for decontamination prior to leaving the work area so that contamination is not spread off-site or to clean areas. All used disposable protective clothing, such as Tyvek coveralls, gloves, and booties, will be containerized for later disposal. Decontamination water will be containerized in 55-gallon drums.

Personnel decontamination procedures will be as follows:

1. Wash neoprene boots (or neoprene boots with disposable booties) with Liquinox or Alconox solution and rinse with clean water. Remove booties and retain boots for subsequent reuse.

2. Wash outer gloves in Liquinox or Alconox solution and rinse in clean water. Remove outer gloves and place into plastic bag for disposal.

3. Remove Tyvek or coveralls. Containerize Tyvek for disposal and place coveralls in plastic bag for reuse.

4. Remove air purifying respirator (APR), if used, and place the spent filters into a plastic bag for disposal. Filters should be changed daily or sooner depending on use and application. Place respirator into a separate plastic bag after cleaning and disinfecting.

5. Remove disposable gloves and place them in plastic bag for disposal.

6. Thoroughly wash hands and face in clean water and soap.

2.2 DRILLING AND MONITORING WELL INSTALLATION EQUIPMENT DECONTAMINATION

All drilling equipment should be decontaminated at a designated location on-site before drilling operations begin, between borings, and at completion of the project.

Monitoring well casing, screens, and fittings are assumed to be delivered to the site in a clean condition. However, they should be steam cleaned on-site prior to placement downhole. The drilling subcontractor will typically furnish the steam cleaner and water.

After cleaning the drilling equipment, field personnel should place the drilling equipment, well casing and screens, and any other equipment that will go into the hole on clean polyethylene sheeting.

The drilling auger, bits, drill pipe, temporary casing, surface casing, and other equipment should be decontaminated by the drilling subcontractor by hosing down with a steam cleaner until thoroughly clean. Drill bits and tools that still exhibit particles of soil after the first washing should be scrubbed with a wire brush and then rinsed again with a high-pressure steam rinse.

All wastewater from decontamination procedures should be containerized.

2.3 BOREHOLE SOIL SAMPLING EQUIPMENT DECONTAMINATION

The soil sampling equipment should be decontaminated after each sample as follows:

1. Prior to sampling, scrub the split-barrel sampler and sampling tools in a bucket using a stiff, long bristle brush and Liquinox or Alconox solution.
2. Steam clean the sampling equipment over the rinsate tub and allow to air dry.
3. Place cleaned equipment in a clean area on plastic sheeting and wrap with aluminum foil.
4. Containerize all water and rinsate.

5. Decontaminate all pipe placed down the hole as described for drilling equipment.

2.4 WATER LEVEL MEASUREMENT EQUIPMENT DECONTAMINATION

Field personnel should decontaminate the well sounder and interface probe before inserting and after removing them from each well. The following decontamination procedures should be used:

1. Wipe the sounding cable with a disposable soap-impregnated cloth or paper towel.

2. Rinse with deionized organic-free water.

2.5 GENERAL SAMPLING EQUIPMENT DECONTAMINATION

All nondisposable sampling equipment should be decontaminated using the following procedures:

1. Select an area removed from sampling locations that is both downwind and downgradient. Decontamination must not cause cross-contamination between sampling points.

2. Maintain the same level of protection as was used for sampling.

3. To decontaminate a piece of equipment, use an Alconox wash; a tap water wash; a solvent (methanol or hexane) rinse, if applicable or dilute (0.1 N) nitric acid rinse, if applicable; a distilled water rinse; and air drying. Use a solvent (methanol or hexane) rinse for grossly contaminated equipment (for example, equipment that is not readily cleaned by the Alconox wash). The dilute nitric acid rinse may be used if metals are the analyte of concern.

4. Place cleaned equipment in a clean area on plastic sheeting and wrap with aluminum foil.

5. Containerize all water and rinsate.

SOP APPROVAL FORM

TETRA TECH EM INC.

ENVIRONMENTAL STANDARD OPERATING PROCEDURE

SLUDGE AND SEDIMENT SAMPLING

SOP NO. 006

REVISION NO. 3

Last Reviewed: January 2000

KRiesing

Quality Assurance Approved

May 18, 1993

Date

1.0 BACKGROUND

Sludges are semisolid materials ranging from dewatered solids to high-viscosity liquids. Sludges generally accumulate as residuals of water-bearing waste treatment or industrial process systems. Sludges typically accumulate in tanks, drums, impoundments, or other types of containment systems.

Sediments generally are materials deposited in surface impoundments or in natural waterways such as lakes, streams, and rivers.

1.1 PURPOSE

This standard operating procedure (SOP) establishes the requirements and procedures for sampling sludge in open drums and shallow tanks (3 feet deep or less) and sediment in lakes, streams, and rivers.

1.2 SCOPE

This SOP applies to collection of sludge and sediment samples. It provides detailed procedures for gathering such samples with specific equipment.

1.3 DEFINITIONS

Gravity Corer: Metal tube with a tapered nosepiece on the bottom and a check valve on the top. The nosepiece reduces core disturbance during penetration. The check valve allows air and water to pass through the sampler during deployment and prevents sample loss (washout) during retrieval.

Hand Corer: Thin-wall metal tube with a tapered nosepiece, a “T” handle to facilitate sampler deployment and retrieval, and a check valve on top.

Ponar Grab Sampler: A clamshell-type metal scoop activated by a counter-lever latching system.

1.4 REFERENCES

American Public Health Association. 1975. "Standard Methods for the Examination of Water and Wastewater." 14th Edition. Washington DC.

U.S. Environmental Protection Agency (EPA). 1984. "Characterization of Hazardous Waste Sites -- A Methods Manual. Volume II -- Available Sampling Methods." Second Edition. EPA-600/A-84-076. December.

EPA. 1994. "Sediment Sampling." Environmental Response Team SOP #2016 (Rev. #0.0, 11/17/94). On-Line Address: http://204.46.140.12/media_resrcs/media_resrcs.asp?Child1=

1.5 REQUIREMENTS AND RESOURCES

The selection of sampling equipment and procedures should be based on project objectives and site-specific conditions such as the type and volume of sludge or sediment to be sampled, sampling depth, and the type of sample required (disturbed or undisturbed). The selected sampling equipment should be constructed of inert materials that will not react with the sludge or sediment being sampled.

The following equipment may be required to sample sludge or sediment:

- Plastic sheeting
- Field logbook
- Spoons or spatulas
- Stainless-steel scoop or trowel
- Gravity corer
- Ponar grab sampler
- Stainless-steel or Teflon® tray
- Hand corer
- Nylon rope
- Sample containers and labels
- Chain-of-custody and shipping materials
- Decontamination materials

2.0 PROCEDURES

This section provides general procedures for sampling sludge and sediment. Sections 2.1 through 2.4 specify the methods and equipment to be used for such sampling.

Sludge Sampling

Sludge can often be sampled using a stainless-steel scoop or trowel (see Section 2.1). Frequently sludge forms when components with higher densities settle out of a liquid. When this happens, the sludge may still have an upper liquid layer above the denser components. When the liquid layer is sufficiently shallow, the sludge may be sampled using a hand corer (see Section 2.2). Use of the hand corer is preferred because it results in less sample disturbance. The hand corer also allows for the collection of an aliquot of the overlying liquid. This prevents drying or excessive oxidation of a sample before analysis. The hand corer may also be adapted to hold a brass, polycarbonate plastic, or Teflon® liner.

A gravity corer may also be used to collect samples of most sludges and sediments (see Section 2.3). A gravity corer is capable of collecting an undisturbed sample that profiles the strata present in a sludge or sediment. Depending on the weight of the gravity corer and the density of the sludge or sediment, a gravity corer may penetrate the material up to 30 inches. If the layer is shallow (less than 1 foot), gravity corer and hand corer penetration may damage any underlying liner or confining layer. In such situations, a Ponar grab sampler may be used because it is generally capable of penetrating only a few inches (see Section 2.4).

Sediment Sampling

Sediment can be sampled in much the same manner as sludge; however, a number of additional factors must be considered. In streams, lakes, and impoundments, for instance, sediment is likely to demonstrate significant variations in composition.

For stream sediment sampling, the sampling location farthest downstream should be sampled first. Sediment samples collected in upstream and downstream locations should be obtained in similar depositional environments and, whenever possible, should be obtained from slow-moving pools. In addition, a sediment sample should be collected at approximately the same location as an associated aqueous sample. Aqueous samples should be obtained first to avoid collecting suspended particles that may result from sediment sampling. To avoid disturbing an area to be sampled, sampling locations in streams should always be approached from the downstream side.

Sediment samples collected from lakes and impoundments should also be collected at approximately the same locations as associated aqueous samples. As in stream sampling, aqueous samples should be collected first to avoid collecting suspended particles that may result from sediment sampling. Downgradient and background samples should be collected from similar depositional environments.

Exact sampling locations should be documented in field logbooks or on data sheets with respect to fixed reference points. In addition, the presence of rocks, debris, or organic material in the sludge or sediment to be sampled may preclude use or require modification of sampling equipment.

The following subsections specify methods for sludge or sediment sampling with specific equipment.

2.1 SAMPLING WITH A SCOOP OR TROWEL

Sludge or sediment samples may be collected with a simple scoop or trowel. This method is more applicable to sludge but can also be used for sediments, provided that the water is very shallow (a few inches). However, using a scoop or trowel may disrupt the water-sediment interface and cause substantial sample alteration. This method provides a simple, quick means of collecting a disturbed sample of sludge or sediment.

The following procedure can be used for sampling sludge or sediment with a scoop or trowel:

1. Place all sampling equipment on plastic sheeting next to the sampling location. Sample containers should be selected in accordance with the requirements in SOP No. 016, Sample Container, Preservation, and Maximum Holding Time Requirements.

2. Affix a completed sample container label to the appropriate sample container.

3. Carefully insert a precleaned scoop or trowel into the sludge or sediment and remove the sample. In the case of sludge exposed to air, remove the first 2 to 4 inches of material before collecting the sample.

4. When compositing a series of grab samples, combine the samples in a stainless-steel bowl or Teflon® tray.

5. Transfer the sample into the labeled container using a stainless-steel or plastic spoon, spatula, or similar tool.

6. If required, preserve the sample in accordance with SOP No. 016, Sample Container, Preservation, and Maximum Holding Time Requirements.

7. Ensure that a Teflon® liner is present in the sample container cap, if required. Secure the cap tightly on the sample container.

8. Complete all chain-of-custody documents, field logbook entries, and sample packaging requirements.

9. Decontaminate all nondisposable sampling equipment after each use and between sampling locations using the procedures in SOP No. 002, General Equipment Decontamination.

2.2 SAMPLING WITH A HAND CORER

The hand corer (see Figure 1) is used in the same situations and for the same materials as those described for the use of a scoop or trowel (see Section 2.1). However, the hand corer may be used to collect an undisturbed sample that can profile any stratification resulting from changes in material deposition.

Some hand corers can be fitted with extension handles that allow collection of samples underlying a shallow layer of liquid. Most hand corers can be adapted to hold liners, which are generally available in brass, polycarbonate plastic, or Teflon®. A liner material should be chosen that will not compromise the intended analytical procedures.

The following procedure can be used for sampling sludge or sediment with a hand corer:

1. Place all sampling equipment on plastic sheeting next to the sampling location. Sample containers should be selected in accordance with the requirements in SOP No. 016, Sample Container, Preservation, and Maximum Holding Time Requirements.

2. Affix a completed sample container label to the appropriate sample container.

3. Position a precleaned hand corer above the sampling location. Carefully deploy the hand corer into the sludge or sediment using a smooth, continuous motion.

4. When the hand corer is at the desired depth, rotate the "T" handle and retrieve the hand corer using a single, smooth motion.

5. Remove the nosepiece and extract the sample. Place the sample on a clean stainless-steel or Teflon® tray.

6. Transfer the sample into the labeled container using a stainless-steel or plastic spoon, spatula, or similar tool.

7. If required, preserve the sample in accordance with SOP No. 016, Sample Container, Preservation, and Maximum Holding Time Requirements.

8. Ensure that a Teflon® liner is present in the sample container cap, if required. Secure the cap tightly on the sample container.

9. Complete all chain-of-custody documents, field logbook entries, and sample packaging requirements.

10. Decontaminate all nondisposable sampling equipment after each use and between sampling locations using the procedures in SOP No. 002, General Equipment Decontamination.

2.3 SAMPLING WITH A GRAVITY CORER

A gravity corer (see Figure 2) can collect essentially undisturbed samples to profile strata that develop in sediment and sludge during the deposition process. Depending on the sediment or sludge density and the gravity corer's weight, the sampler typically can penetrate the sediment or sludge to a depth of 30 inches.

Gravity corers should be used carefully in open drums, shallow tanks, or lagoons with liners. A gravity corer could penetrate beyond the sludge or sediment layer and damage the liner material.

The following procedure can be used for sampling sludge or sediment with a gravity corer:

1. Place all sampling equipment on plastic sheeting next to the sampling location. Sample containers should be selected in accordance with the requirements in SOP No. 016, Sample Container, Preservation, and Maximum Holding Time Requirements.

2. Affix a completed sample container label to the appropriate sample container.

3. Attach the required length of sample line to a precleaned gravity corer. Braided, 3/16-inch nylon line is sufficient; however, 3/4-inch nylon line is easier to grasp during hoisting.

4. Secure the free end of the line to a fixed support to prevent accidental loss of the gravity corer.

5. Position the gravity corer above the sampling location. Allow the gravity corer to fall freely through the liquid and penetrate the sludge or sediment layer.

6. Retrieve the gravity corer with a smooth, continuous lifting motion. Do not bump the corer, as this may result in some sample loss.

7. Remove the nosepiece from the gravity corer. Slide the sample out of the corer into a stainless-steel or Teflon® pan.

8. Transfer the sample into the labeled container using a stainless-steel or plastic spoon, spatula, or similar tool.

9. If required, preserve the sample in accordance with SOP No. 016, Sample Container, Preservation, and Maximum Holding Time Requirements.

10. Ensure that a Teflon® liner is present in the sample container cap, if required. Secure the cap tightly on the sample container.

11. Complete all chain-of-custody documents, field logbook entries, and sample packaging requirements.

12. Decontaminate all nondisposable sampling equipment after each use and between sampling locations using the procedures in SOP No. 002, General Equipment Decontamination.

2.4 SAMPLING WITH A PONAR GRAB SAMPLER

A Ponar grab sampler (see Figure 3) can be used to sample most types of sludges and sediments. Its penetration depth usually does not exceed several inches. The Ponar grab sampler, like other grab samplers, cannot collect undisturbed samples; therefore, this sampler should be used only after all overlying water samples have been collected.

The following procedure can be used for sampling sludge or sediment with a Ponar grab sampler:

1. Place all sampling equipment on plastic sheeting next to the sampling location. Sample containers should be selected in accordance with the requirements in SOP No. 016, Sample Container, Preservation, and Maximum Holding Time Requirements.

2. Affix a completed sample container label to the appropriate sample container.

3. Attach the required length of sample line to a precleaned Ponar grab sampler. Braided, 3/4-inch nylon line is recommended for ease in hoisting.

4. Measure the distance from the water surface or other reference point to the top of the sludge or sediment. Mark this measurement on the sample line. To avoid unnecessary disturbance of the sludge or sediment from lowering the Ponar grab sampler too quickly, it is recommended that a second mark be made on the sample line to indicate the proximity of the reference mark.

5. Open the Ponar sampler's jaws until they are latched. The jaws will be triggered if the Ponar sampler comes in contact with or is supported by anything other than the sample line. Tie the free end of the sample line to a fixed support.

6. Position the Ponar grab sampler above the sampling location. Lower the sampler until the proximity mark is reached. Then, slowly lower the Ponar grab sampler until it touches and penetrates the sludge or sediment.

7. Allow the sample line to slacken a few inches to release the latching mechanism that closes the sampler's jaws. As the jaws close, they scoop the sludge or sediment up into the sampler. More slack may be required when sampling in surface waters with strong currents.

8. Retrieve the sampler and release its contents into a stainless-steel or Teflon® tray.

9. Transfer the sample into the labeled container using a stainless-steel or plastic spoon, spatula, or similar tool.

10. If required, preserve the sample in accordance with SOP No. 016, Sample Container, Preservation, and Maximum Holding Time Requirements.

11. Ensure that a Teflon® liner is present in the sample container cap, if required. Secure the cap tightly on the sample container.

12. Complete all chain-of-custody documents, field logbook entries, and sample packaging requirements.

13. Decontaminate all nondisposable sampling equipment after each use and between sampling locations using the procedures in SOP No. 002, General Equipment Decontamination.

FIGURE 1

HAND CORER

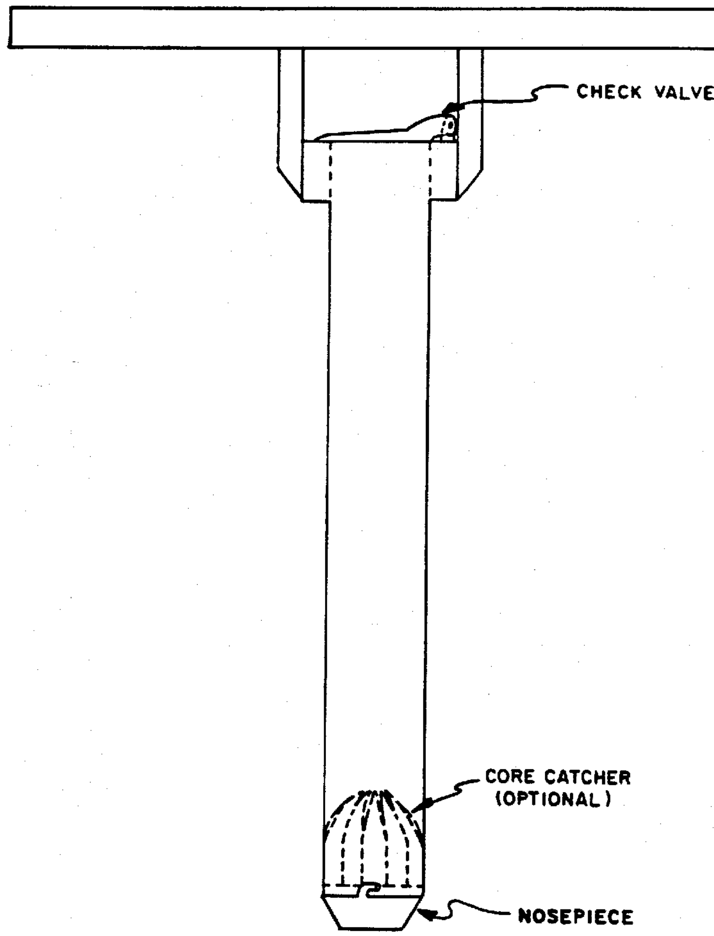


FIGURE 2

GRAVITY CORER

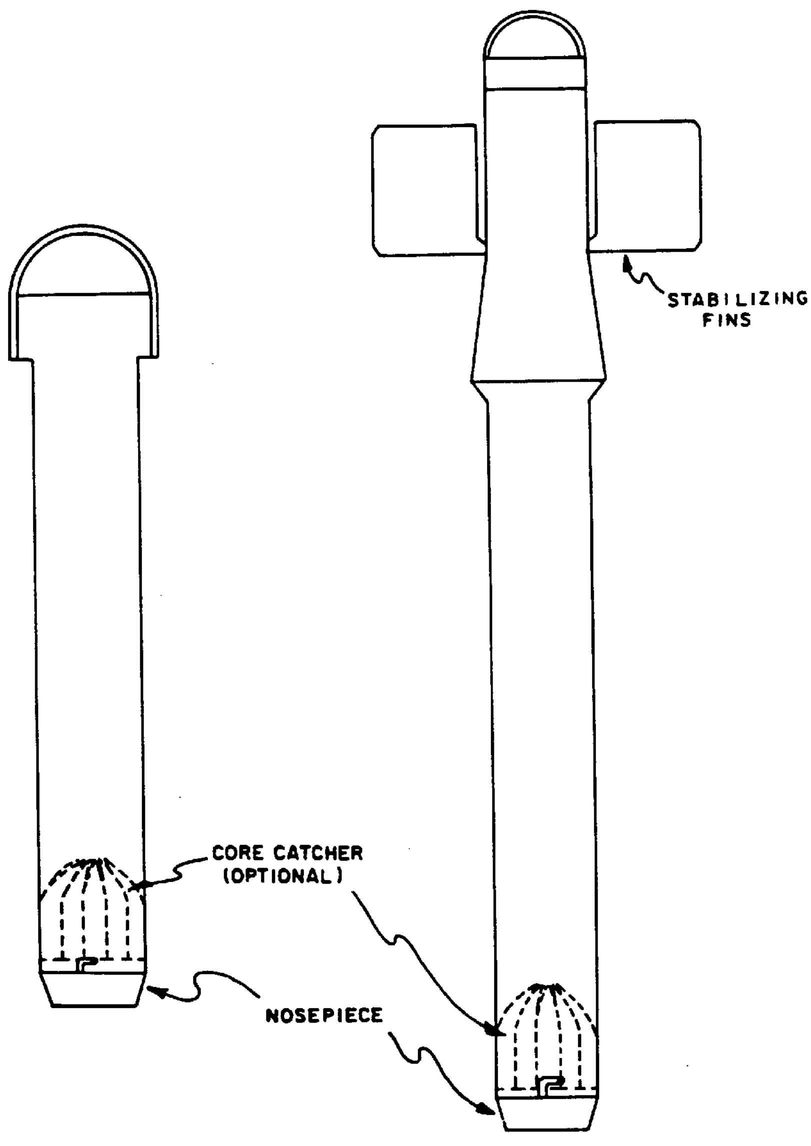
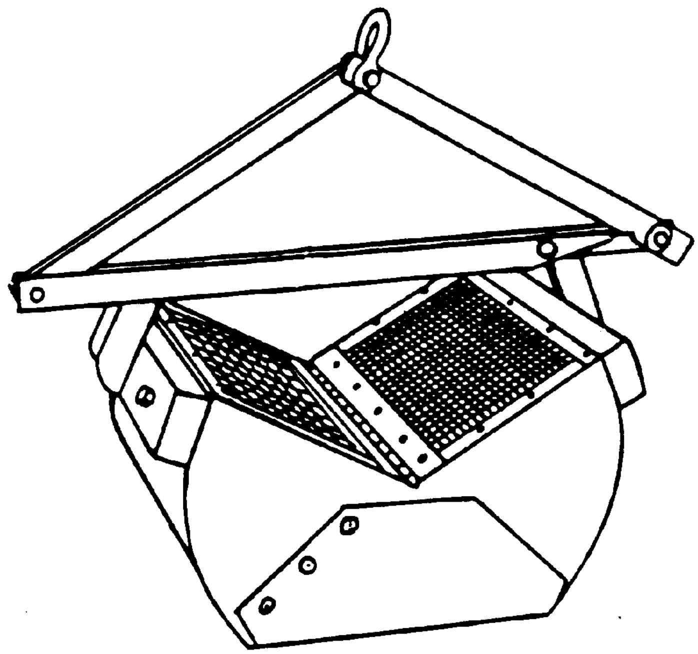


FIGURE 3

PONAR GRAB SAMPLER



APPENDIX F
EXAMPLE CHAIN-OF-CUSTODY FORM

Tetra Tech EM Inc.
San Francisco Office

135 Main St. Suite 1800
San Francisco, CA 94105
415-543-4880
Fax 415-543-5480

0859

Chain of Custody Record

Page ______ of ______

PO#	Lab:

Project name:	TtEMI technical contact:	Field samplers:
Project number:	**TtEMI project manager:**	**Field samplers' signatures:**

					No./Container Types								Preservative Added / Analysis Required																	
Sample ID	Sample Description/Notes	Date	Time	Matrix	40 ml VOA	1 Liter Amber	1 Liter Poly	Brass Tube	Glass Jar				CLP VOA	CLP SVOA	CLP Pest/PCBs	CLP Metals	TPH Purgeables	TPH Extractables												

EXAMPLE

	Name (print)	Company Name	Date	Time
Relinquished by:				
Received by:				
Relinquished by:				
Received by:				
Relinquished by:				
Received by:				
Relinquished by:				
Received by:				

Turnaround time/remarks:

APPENDIX G
APPROVED LABORATORIES

TABLE G-1: TETRA TECH EM INC.-APPROVED LABORATORIES UNDER BASIC ORDERING AGREEMENT

Draft Data Gaps Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11
Naval Weapons Station Seal Beach Detachment Concord, Concord, California

Analytica Group	
Lab Address:	12189 Pennsylvania Street Thornton, CO 80241
Point of Contact:	Joe Egry / Mary Fealey
Phone:	(800) 873-8707 X103/X135
Fax:	(303) 469-5254
Business Size:	SWO
E-mail	mfealey@analyticagroup.com

Applied Physics and Chemistry Laboratory	
Lab Address:	13760 Magnolia Avenue Chino, CA 91710
Point of Contact:	Dan Dischner / Eric Wendland
Phone:	(909) 590-1828 X203/X104
Fax:	(909) 590-1498
Business Size:	SDB
E-mail	marketing@apclab.com

Columbia Analytical Services	
Lab Address:	5090 Caterpillar Road Redding, CA 96003
Point of Contact:	Karen Sellers / Howard Boorse
Phone:	(530) 244-5262 / (360) 577-7222
Fax:	(530) 244-4109
Business Size:	LB
E-mail	lkennedy@kelso.caslab.com

Curtis and Tompkins, Ltd	
Lab Address:	2323 Fifth Street Berkeley, CA 94710
Point of Contact:	Anna Pajarillo / Mike Pearl
Phone:	(510) 486-0925 X103/ X108
Fax:	(510) 486-0532
Business Size:	SB
E-mail	mikep@ctberk.com

EMAX Laboratories Inc.	
Lab Address:	1835 205th Street Torrance, CA 90501
Point of Contact:	Ye Myint / Jim Carter
Phone:	(310) 618-8889 X121/X105
Fax:	(310) 618-0818
Business Size:	SDB/WO
E-mail	ymyint@emaxlabs.com

Laucks Laboratories	
Lab Address:	940 S. Harney Street Seattle, WA 98108
Point of Contact:	Mike Owens / Kathy Kreps
Phone:	(206) 767-5060
Fax:	(206) 767-5063
Business Size:	SB
E-mail	KathyK@lauckslabs.com

Sequoia Analytical	
Lab Address:	1455 McDowell Blvd. North Suite D Petaluma, CA 94954
Point of Contact:	Michelle Wiita
Phone:	(707) 792-7517
Fax:	(707) 792-0342
Business Size:	LB
E-mail	

Notes:

DHS	California Department of Health Services
LB	Large business
SB	Small business
SDB	Small disabled business
SWO	Small woman-owned
WO	Woman-owned

APPENDIX H
RESPONSES TO AGENCY COMMENTS ON THE DRAFT
DATA GAPS SAMPLING AND ANALYSIS PLAN
TIDAL AREA SITES 2, 9, AND 11

RESPONSES TO AGENCY COMMENTS
DRAFT DATA GAP SAMPLING AND ANALYSIS PLAN
TIDAL AREA SITES 2, 9, AND 11
NAVAL WEAPONS STATION SEAL BEACH, DETACHMENT CONCORD
CONCORD, CALIFORNIA (DATED 13 JULY 2004)

The U.S. Environmental Protection Agency (EPA), the San Francisco Bay Regional Water Quality Control Board (RWQCB), the California Department of Fish and Game (CDFG), and the U.S. Fish and Wildlife Service (USFWS) reviewed and provided comments on the U.S. Department of the Navy's document, "Draft Data Gap Sampling and Analysis Plan, Tidal Area Sites 2, 9, and 11, Naval Weapons Station Seal Beach, Detachment Concord, Concord, California," dated July 13, 2004. The agencies' comments are provided in the following text, along with the Navy's responses. Tables and figures, which are included with these responses, are presented at the end of this appendix.

COMMENTS FROM EPA

The EPA comments were presented in a letter dated September 21, 2004.

EPA General Comment 1

The SAP does not address all data gaps previously identified by U.S. EPA during past Remedial Investigation (RI) Report reviews. The data gaps listed below were last identified during a review of the response to agency comments on an August 8, 2003, Revised Draft Final RI Report, (later reclassified as "draft") and the meeting minutes and handouts for the May 14, 2004 meeting. Please revise the Sampling and Analysis Plan (SAP) so that it proposes additional sampling to address each of these data gaps.

- **U.S. EPA first identified a potential dioxin/furan data gap during the review of the 1997 Draft RI and requested further investigation of dioxins at the Wood Hogger Site at that time. U.S. EPA' comments on both a 1999 and 2003 RI version requested that the depth at which the additional dioxin/furan samples had been collected be provided. The Navy's January 3, 2004, response to U.S. EPA's October 30, 2003, RI review stated that additional dioxin characterization and past sampling information would be provided in the Tidal Area Sites Sampling Plan; however, the Navy has not addressed any of the issues raised for dioxin in the Tidal Area Sites Sampling Plan.**
- **Groundwater has not been sampled at the Tidal Area Sites 9 and 11 for more than four years. This data gap was identified in U.S. EPA's comments on previous RI reports. U.S. EPA had also suggested integrating a Tidal Area Sites 2, 9, and 11 groundwater sampling plan with Site 1; however, the Tidal Area Sites Sampling Plan does not propose any groundwater characterization (neither chemical analysis nor water elevation surveying). Further, several months ago U.S. EPA was informed of a structural problem with the primary**

tide gate at Otter Slough (broken flap-gates), that has resulted in increased surface water flooding in Site 2 and Site 11. There have been numerous follow-up discussions with the Navy on the status of the repair (yet to occur) and U.S. EPA has indicated that given the months time that has now elapsed since the original gate failure, surface water and groundwater hydrology has likely been changed because of Tidal Area Sites flooding which now occurs due to unrestricted tidal flows into Otter Slough. This groundwater/surface water change will require additional assessments. U.S. EPA has advised the Navy that if the gate was not repaired immediately after the break, the increased tidal flows and site flooding would necessitate further assessments and weaken a Navy position that further groundwater/surface water characterization was no longer required for the Tidal Area Sites. U.S. EPA was under the impression that the Navy understood the implication of continued flooding with regards to surface water groundwater hydrology; however, repairs have not been made.

- **Additional depth-specific samples are needed to determine the vertical extent of mercury soil/sediment contamination near the Wood Hogger Area (Site 11) and Otter Slough. The Navy proposal to only collect surface soil/sediment samples is insufficient. Consistent with the Navy September 3, 2004, Litigation Area Treatability Study outline (and the proposal to collect depth specific samples at Lost Slough to assess the vertical extent of metals contamination), please include additional depth-specific samples.**

Response:

- The agreement by the Navy in its letter to EPA of October 9, 2003 to declare the "revised draft final" RI report of 8 August 2003 as a "draft" report (per the federal facilities agreement [FFA]) represented a significant agreement in terms of site strategy. Although the Navy presented rationale for pursuing no further action at these sites, the Navy agreed to continue the RI with additional data gap field work, revise the RI, and as needed, pursue a feasibility study (FS). On this basis, the Navy met with the agencies in November 2003 and issued the January 29, 2004, draft responses to comments. On May 14, 2004, the Navy and agencies met and discussed the Navy's proposed strategy for the additional data gap field investigations. Materials provided to the agencies in advance of the meeting included a proposed technical approach for the data gaps sampling that included this statement:

Risk to Human Health in Site 2 and Site 11.

The Navy's recognition of the need for action at these sites (likely in the form of institutional controls to prohibit residential development) obviates the need for additional sampling to continue or refine the evaluation of residential exposure risk. This is true because risks at the Tidal Area sites lie within the risk management range of $1x10^{-4}$ to $1x10^{-6}$. As a result, no additional sampling is proposed to address this issue.

The Navy's revised strategy presented to the agencies concedes that an FS will be required for the Tidal Area Sites and that land use controls will be considered in the FS to address residential risks to human health estimated to be within the risk management range of 1×10^{-4} to 1×10^{-6}**.** Limited remedial actions for dioxin/furans (such as land use controls) will be considered in the FS because dioxin/furans were not detected at the sites at concentrations that would pose a threat to ecological receptors. In addition, these limited actions were considered because the risk to human health lies within the risk management range for residential exposure.

More extensive analysis for dioxins was conducted at Site 11 in 1998 because dioxins and furans were detected in sediment during the 1995 RI sampling event at WHSSB019 and WHSSB020. During that sampling event, surface soil samples were collected and analyzed for dioxins at 10 additional locations; all samples analyzed for dioxin were surface samples collected from 0 to 0.5 feet below ground surface. Analytical results from all dioxin analysis of sediment and soil samples was included in the August 8, 2003, draft final remedial investigation. The Navy has prepared Tables H-1 and H-2, which are included the end of these responses to comments, to provide a summary of the information on dioxins and furans, including toxicity equivalency quotients (TEQs) for each sample. The locations of samples submitted for analysis of dioxins from Site 11 are illustrated on the attached Figure H-1.

It is the Navy's opinion that no data gap is associated with dioxin/furans in soil or sediment at any of the Tidal Area Sites for the following reasons:

i. The number of samples collected and analyzed provides adequate screening (see Figure H-1).

ii. None of the TEQs result in cancer risk numbers greater than 1×10^{-4} (see attached Tables H-1 and H-2).

iii. The Navy has agreed to include the Site 11 (as well as Sites 2 and 9) in an FS for the protection of human health for cancer risks that lie within the risk management range (1×10^{-4} to 1×10^{-6}).

Dioxins in soil are ubiquitous, resulting from fallout from numerous sources. EPA has estimated that the average soil toxicity equivalent factor (TEF) in North America is 0.00796 micrograms per kilogram (μg/kg) (plus or minus 0.0057 μg/kg). This level equals is 7.96 picograms/g (pg/g) (plus or minus 5.7 pg/g). Typical sediment samples from San Francisco Bay are less than 10.0 pg/g (SFEI 2004).

The only data for soils systematically collected in California come from a study funded by the California Department of Agriculture (CDFA), where more than 30 locations of undisturbed or agricultural soils were sampled throughout the state. The mean concentration was 5.72 pg/g (sd = 4.74). These data are consistent with EPA's estimates for I-TEQs as <10 pg/g. Samples were mostly non-detects, except that OCDD was almost always present (Petreas and others 2003).

No toxicological screening criterion for soil or sediment has been issued by the EPA. The Canadian guideline for soil is 4.0 pg/g. The probable effects level for marine invertebrates, adopted as a Canadian standard, is 21.5 pg/g.

No dioxins were detected in any of the sediment samples from Otter Slough. Three samples at the Site 11 exceeded a TEF of 10.0, as follows: WHSSB009 (91.0 pg/g [written as 0.091 µg/kg on Table H-1]); WHSSB016 (210 pg/g); and WHSSB023 (23.0 pg/g). However, none of these samples contained dioxin at concentrations to indicate risk to higher trophic level ecological receptors, such as the great blue heron or river otter. As Section 6.4.2 of the revised draft final ecological risk assessment (ERA) states: "For the Great Blue Heron, the HQ [hazard quotient] (typical dose/low TRV) for total dioxins was 1.6; for the river otter, it was less than 1.0." The habitat in this area of the Site 11 is poor, characterized by compacted soil and sparse upland vegetation. The Navy is confident that dioxin in this area is not placing ecological receptors at risk.

- The Navy agrees that additional assessment of groundwater and surface water is required due to the change in site conditions. After further review of the broken tide gate and surface water conditions of the Tidal Area Sites (particularly Site 2), then Navy is proposing to not repair the tide gate and to reassess groundwater and surface water based on existing site conditions. The ability for tidal flows to enter the sites via means other than Otter Slough, the currently low elevation and continued settling of Baker Road and, the potential for an intact tide gate to actually exacerbate outward sediment transport are only some of the reasons for this proposal not to repair the tide gate.

  The Navy plans to integrate groundwater sampling proposed for the Site 1 landfill with additional groundwater water level measurements at Sites 2, 9, and 11 to assess the current groundwater and surface water conditions of the Tidal Area sites. The Navy had suggested water level measurements at a number of the wells from Sites 2, 9, and 11 in an effort to integrate the sites during an initial scoping meeting for the Site 1 groundwater study. However, EPA feedback from that meeting was that the Site 1 groundwater evaluation should be focused on Site 1, and should not be expanded to include all the Tidal Area sites. However, based on this more recent comment, the Navy has included the assessment of groundwater and surface water of Sites 2, 9, and 11 in the draft final Sampling and Analysis Plan (SAP) for the Additional Groundwater Investigation for the Tidal Area Landfill, Site 1. An assessment of groundwater conditions in those groundwater monitoring wells is not included in this data gaps SAP for Sites 2, 9, and 11 because the sampling is described in the Site 1 SAP.

The proposed groundwater elevation measurements and other water characterization efforts for the Sites 2, 9, and 11 will be collected and analyzed as described in the draft final SAP for Additional Groundwater Investigation at the Tidal Area Landfill, Site 1 because EPA has concurred with this approach.

Waste disposal within the landfill at Site 1 constitutes a long-term potential source of contaminants to groundwater in the Tidal Area. As a result, wells surrounding Site 1 will be sampled and analyzed first in accordance with the Draft Final Sampling and Analysis Plan for Additional Groundwater Investigation at the Tidal Area Landfill (Site 1) and then over the long term in accordance with the future Site 1 Closure and Post-Closure Maintenance Plan. Groundwater sampling under these plans at Site 1 will include a wide range of constituents to evaluate whether hazardous constituents are migrating from the landfill. Sampling of these wells (and of additional wells to be installed) is described in the Draft Final Sampling and Analysis Plan for Additional Groundwater Investigation at Tidal Area Landfill (Site 1).

It is noteworthy that the Tidal Area Sites RI (TtEMI 2003) and the Groundwater Sampling Summary Report for the Tidal Area Landfill, Site 1 (TtEMI 2004a) conclude that Tidal Area Sites 1, 2, 9, and 11 are not affected by volatile or semivolatile organic compounds. Naturally occurring inorganic constituents have been detected at various concentrations in the Tidal Area wells. The variations in concentrations of these inorganic constituents is not unexpected because of several factors, including variations in groundwater pH, oxygen reduction potential, dissolved oxygen, depth of the screened interval, and differences in geology (such as fill thickness). However, in evaluating Sites 2, 9, and 11, data have not been obtained that suggest that the variations observed in concentrations of metals in groundwater are a result of inorganic contamination in soils, nor have data been obtained to suggest that groundwater at the site is contaminated.

Although water level measurements are recommended throughout the Tidal Area to assess flow direction of groundwater, groundwater sampling and analytical testing are not recommended except near the landfill, where existing landfill waste materials are an ongoing potential source as described above.

Please refer to the Sampling and Analysis Plan for Additional Groundwater Investigation at Tidal Area Landfill, Site 1, for a description of all proposed groundwater level measurements and the complete sampling and analytical testing proposed. Wells are not proposed for groundwater measurements or sampling and analysis in the Tidal Area Sites Data Gaps SAP.

- The Navy agrees that delineation of the depth of mercury in sediments at the southwestern corner of Site 11 is desirable. The Navy has revised the SAP to include sampling below the surface.

EPA General Comment 2	**U.S. EPA General Concern for Site 2 (R-Area Disposal Site). While the Navy has not proposed any specific assessments associated with R-Area Disposal Site, U.S. EPA (in additional to commenting on hydrology) would like to reiterate our concern with the site overall, with the characterization work completed to date, and with the direction the Navy has taken with this site. U.S. EPA Program staff, as discussed in the past, have concerns with the original unbiased sampling grid that was established for Site 2. In particular, U.S. EPA has been concerned with the extent site audit information regarding disposal activities and locations was collected for developing the sampling grid. U.S. EPA is concerned that actual disposal areas have not been well described and the developed unbiased sampling grid may not have aided in identify the actual disposal area(s). Further, most (or all?) of the Site 2 samples were collected at the surface, which would not reflect contamination at depth. In order to avoid project delays like the recently finalized Site 1 (Tidal Area Landfill) ROD (Proposed Plan in 1999; ROD signatures in 2004) the Navy and the regulatory team needs to better understand our mutual concerns with areas like Site 2 (and Site 11), in order to resolve technical matters in a timely manner and keep the CERCLA process moving forward at an acceptable pace.**
Response:	The Navy shares EPA's concern regarding the resolution of issues in a timely manner to expedite the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process at these sites. All of the work conducted to date at Site 2 (R Area) has been conducted in accordance with sampling and analysis plans that were reviewed by EPA and other agencies. Although it appears that sampling and analysis of samples throughout Site 2 is unbiased, there is a higher concentration of samples along Baker Road, and immediately to the east, than in the eastern portion of Site 2. The Navy has collected and analyzed more than 100 sediment samples, and 15 surface water samples from Site 2 and has prepared a baseline ERA for this site (TtEMI 2002). The ERA included evaluation of risk to benthic invertebrates as well as to higher trophic level predators. Spatial analysis was performed on data from Site 2 to examine possible effects of chemicals migrating from the landfill (Site 1). None of these evaluations indicated that significant ecological risk is posed by chemicals at Site 2. Similarly, the revised human health risk assessment prepared for Site 2 does not reveal unacceptable human health risks (TtEMI 2003). The Navy has not identified any data gaps that will preclude the successful evaluation of remedial alternatives to address the low potential risk to human health and the environment that has been identified for Site 2.

EPA Specific Comment 1	**As described in previous agency comments, U.S. EPA had raised in its October 30, 20003, review of the August 8, 2003, Draft RI Report, specific concerns with dioxin contamination and need for additional soils characterization. U.S. EPA's specific comment number 12 stated:** **"The areal extent of the polychlorinated dibenzodioxin (PCDD)/ polychlorinated dibenzofuran (PCDF) contamination may not have been determined at the Wood Hogger Site. The Draft RI shows that maximum PCDD/PCDF concentrations of 115 micrograms per kilogram (µg/kg) and 172 µg/kg were detected in samples collected at WHSSB009 and WHSSB016, respectively. However, these concentrations were not converted to toxicity equivalent factors (TEFs). The average soil toxicity equivalent factor (TEF) for North America (i.e., 0.0137 µg/kg is the upper range) is only compared to concentrations detected at WHSSB018, where only 0.01 µg/kg PCDD/PCDF were detected. Since PCDD/PCDF concentrations detected at six of the ten locations sampled for PCDD/PCDF (i.e., locations WHSSB008, -009, -016, -109, -050, and -051) had concentrations equal to or exceeding 2 µg/kg, this indicates that the areal extent of the PCDD/PCDF contamination may not be determined. Please propose further investigative actions for the Wood Hogger Site to determine the extent of PCDD/PCDF.** **In addition, in order to determine if the vertical extent of the PCDD/PCDF contamination at the Wood Hogger Site has been delineated, please provide the depths from which the additional PCDD/PCDF samples were collected. Also, if available, please provide TEF results for the soil and sediment samples collected at OSLSL006, WHSSB007, WHSSB017, and WHSSB018, which are included on Figure 1-2.** **Lastly, please discuss why concentrations at location WHSSB018 were compared to the TEF since the Report only discusses initial dioxin sampling at locations WHSSB019 and WHSSB020."** **A January 29, 2004, written Navy response to U.S. EPA's comment was; "<u>The Navy will prepare a sampling and analysis plan to more precisely delineate and characterize the extent of PCDD/PCDF at the Wood Hogger Site. The depths from which additional PCDD/PCDF samples will be taken will be presented in the plan</u> (emphasis added)." Please revised the Draft SAP to include additional dioxin samples which were agreed to in principle by the Navy earlier this year.**
Response:	As mentioned in the response to EPA General Comment 1, the Navy's January 29, 2004, response cited above was prepared to address the risk to human health in support of a no further action recommendation for the site. Since the January 29, 2004, responses to comments was issued, the Navy's strategy was revised to include an FS the three sites. The Navy believes that the extent of dioxin at the site is sufficiently characterized to proceed with an FS for the same reasons discussed in the Navy's response to EPA General Comment 1.

Although the remedial investigation did not present TEQs for each sample, an exposure point concentration was calculated for each detected congener and cancer risk was estimated accordingly in the RI for each congener (please see Table K-3-1 of the RI).

A complete summary of dioxin results collected previously from soils sampled at Site 11 and from sediments at Otter Slough is included with these responses to comments on Tables H-1 and H-2. As EPA requested, toxicity equivalency quotients for each sample are presented in the tables. These new tables will be incorporated in the revised RI. A graphic illustration of the location of samples collected for analysis of dioxins in Site 11 are presented on Figure H-1, which is included with these responses to comments.

The cancer risk calculations for dioxin are presented in the RI (see Section 6.2.3). Cancer risks under current and future site configurations and for residential and industrial exposure scenarios are all within the risk management range.

The TEQ value cited in the RI for Site 11 is 0.31. The maximum TEQ presented in the attached Table 1 for the Site 11 is 0.21. These two numbers differ because the EPA has downwardly revised the TEFs since the RI was completed and the revised TEQ of 0.21 is based on the new TEFs.

Dioxin samples were collected in surface soils and sediments at the site because the likely source of dioxins at the site is the former incineration of wood. Based on the previous site use history, the most likely place to detect dioxins is at the surface. As a result, RI sampling at the site focused on surface soils and sediments.

EPA Specific Comment 2

Section 1.1.2.2, Mercury in Sediment at Site 11, Page 4*:* There is not enough evidence to justify the last sentence of the second paragraph on page 4. The sentence suggests that because mercury concentrations were below ecological benchmarks within Otter Sluice, sediments contaminated with mercury are not generally mobile in the area. However, taking into account that the concentrations of mercury distributed across the site are highly variable and that the actual boundary of Otter Sluice has not yet been determined, it does not seem appropriate to draw this conclusion. Please delete the statement from the SAP.

Response: The statement has been deleted as suggested.

EPA Specific Comment 3	**<u>Section 1.1.2.2, Mercury in Sediment at Site 11, Page 4</u>*:* It is difficult to determine if the SAP addresses all of the potential data gaps at the Tidal Area. The text in this section states that nickel was the only was the only detected chemical that exceeded its Effects Range Median (ER-M) in the 14 samples collected from Otter Sluice. However, there is no figure showing the locations of samples collected to characterize nickel either in the SAP, or in the RI. Without this information it is impossible to determine whether nickel has been fully characterized at this site. Please provide a figure within this report showing all chemicals detected above their ER-Ms and the samples used to delineate them.**
Response:	The maximum detected concentration of nickel (112.5 milligrams per kilogram [mg/kg]) in sediment exceeded the ER-M (51.6 mg/kg). However, the maximum detected concentration is less than the ambient concentration of nickel at the Tidal Area Sites (120 mg/kg). As such, nickel is not elevated in the Otter Slough sediment samples collected. A figure illustrating locations chemicals exceeding the ER-M is not relevant to characterizing potential contaminants at the site because no other chemical exceeded the ER-M. The text of the SAP has been revised to clarify this information.
EPA Specific Comment 4	**<u>Section 1.1.2.2. and Figure 4</u>: Proposed Transects at Wood Hogger Site to Investigate Mercury: Regarding the Navy proposal to collect approximately 81 samples for mercury via nine transects along Otter Slough, U.S. EPA recommends moving the transects and collected more samples at each transect. U.S. EPA recommends repositioning transect locations as shown in a revised Figure 4 (see Enclosure B). Transects have been shifted to sample a greater length of Otter Slough, including the upper reach immediately south of Site 11 and at the confluence with the channel heading east towards Hastings Slough. As an alternative to the nine surface samples proposed by the Navy along each transect, U.S. EPA requests that the Navy collect samples at five locations (one boring on each bank, plus three across the slough). However, in addition to the surface sample, U.S. EPA also request that the Navy collect depth-specific sediment samples at 1 to 1.5 feet below sediment surface (bss) and 2.5 to 3.0 feet bss - consistent with the Navy proposal to collect sediment samples in Litigation Area (per the Navy Treatability Study Outline dated September 3, 2004). U.S. EPA would consider a phased approach to analyzing some of the deeper samples, using initial samples to guide subsequent analysis, if the Navy would like to make a proposal. Also, as a useful sampling strategy to handle unforeseen situations, the Navy should consider having a small number of 'contingency' samples available, in the event a hot spot is identified during field work, or if site conditions (for example actual channel configurations) are different from what was expected. Lastly, the Navy should determine slough bathymetry at the transect locations to assess effects of Otter Slough as a groundwater barrier to the Tidal Area Sites (as a part of a necessary groundwater/surface hydrology assessment).**

Response: The Navy has modified the sediment sampling scheme as requested by EPA. As discussed during the regular monthly remedial project manager's (RPM) meeting of October 28, 2004, the Navy is using a phased approach for the analyses. The methodology is described in this SAP. As described in this SAP, bathymetry of the slough will be assessed by surveying sample locations.

EPA Specific Comment 5 **<u>Section 1.1.2.2, Mercury in Sediment at Site 11, Page 9</u>: The mercury detected above its ER-M at sampling location WHSSB024 was not included in the bulleted list on page 9. According to Figure 4 mercury was detected at this location at a concentration of 7.1 milligrams per kilogram. Please include this exceedance on page 9.**

Response: The SAP has been corrected as suggested.

EPA Specific Comment 6 **<u>Section 1.2, Project Description, Page 14</u>: The schedule listed in Table 2 is not consistent with the Site Management Plan (SMP), dated August 12, 2004. The following table lists inconsistencies that were discovered during a comparison of Table 2 and the SMP. Please revise the SAP to be consistent with the SMP.**

Milestone	SAP Cited Dates	SMP Deliverable Dates
Draft Final SAP	11/8/04	11/12/04
Final SAP	No date listed	12/13/04
Field Investigation	6/2/06	11/1/05
Draft Final RI	9/1/06	4/3/06
Final RI	10/3/06	5/5/06

Response: The schedule has been updated in Table 2 of the SAP. To the extent possible, Table 2 of the SAP is consistent with the latest version of the SMP.

EPA Specific Comment 7 **<u>Section 2.2.3, Management of Investigation-Derived Waste, Page 31</u>: It is unclear why the text states that no Investigation Derived Waste (IDW) will be generated during this investigation. The text in Section 2.2.2 states that if nondisposable sampling equipment is used "water derived from decontamination will be collected and temporarily stored onsite for characterization as IDW." Please revise Section 2.2.3 to allow for the possibility that nondisposable sampling equipment may be used.**

Response: Section 2.2.3 has been revised as suggested.

EPA Specific Comment 8 **<u>Section 2.3.1, Sample Identification, Page 32</u>: The numbering scheme is missing information regarding sample numbers at the Wood Hogger Site. The step-outs to confirm the detections of mercury in the southwest corner of Site 11 are not included in the numbering scheme. Please revise this section to include all proposed samples in the numbering scheme.**

Response: The step-out locations have been added to the schedule, as requested.

EPA Specific Comment 9 **<u>Section 2.5.2.1, Field Duplicates, Page 41</u>: It is unclear why a field duplicate is not proposed in the sampling methodology. The text in Section 2.5.2.1 indicates that a field duplicate collected from an adjacent location is not adequate for assessing sampling precision. However, the text does not discuss the possibility of collecting two times the volume to be used as a field duplicate. Please discuss this possibility in this section.**

Response: Section 2.5.2.1 of the draft SAP states the following:

> *Although field duplicate soil samples are sometimes collected as soil samples from adjacent locations, such soil duplicate samples will not be collected for this project for two reasons. First, since adjacent soil samples incorporate some spatial variability, these samples cannot be used directly to assess sampling precision. Further, it is not practical to set QC limits for the RPD of such samples, which precludes the use of these samples for QC purposes. Second, while the spatial variability information that can be obtained from adjacent soil samples may be useful in assessing or implementing remedial options, no objectives relating to these data uses have been identified for this project. Rather, it has been determined that this type of spatial variability information will be obtained during subsequent investigations at this site, if required.*

EPA Specific Comment 10 **<u>Table 3: Data Quality Objectives, Page 16</u>: A concise description of the problem at Site 9 is not included in Step 1. The problem statement does not include a discussion of what is unknown, or what potential data gaps exist, at Site 9. Please revise the problem statement to include a discussion of the data gap to be investigated.**

Response: The Navy has revised the text as suggested.

EPA Specific Comment 11 **<u>Table 3: Data Quality Objectives, Page 16</u>: The principal study question is not combined with possible alternative actions to form a decision statement. For example, what are the possible actions to be taken if the ER-M is exceeded? Please revise Step 2 to include this information.**

Response: Step 5; "Develop Decision Rules" presents possible alternative actions to form a decision statement

EPA Specific Comment 12 **<u>Table 3: Data Quality Objectives, Page 16</u>: The information regarding when the proposed field activities will take place in Step 4 is inconsistent with Table 2 and the SMP. The text in Table 3 suggests that sampling will take place in Winter 2004 or Spring 2005. However, Table 2 lists the starting date for field investigation as June 2, 2006 and the SMP lists the starting date as November 1, 2005. Please resolve these discrepancies.**

Response: The sampling is scheduled for May 2005, and the proposed sampling date has been made consistent throughout the document.

EPA Specific Comment 13	**<u>Table 5: Key Personnel, Page 21</u>: It does not appear that a laboratory has been selected for this project. Please include the selected laboratory in the final version of the SAP.**
Response:	A list of Navy-approved laboratories is included in Appendix G. The laboratory will be selected from the list after the draft final SAP is issued and the work awarded under contract; the selection will be based on available laboratory capacity and pricing.
EPA Specific Comment 14	**<u>Appendix A, Project-Required Reporting Limits, Table A-1</u>: Analytical Report Limits, Page A-1: One of the ER-Ms included in this table does not appear to be correct. Table A-1 lists the ER-M for mercury as 218 mg/kg. Please revise the table to show that 0.71 mg/kg is the ER-M for mercury.**
Response:	The ER-M in Table A-1 of the SAP has been revised as requested.
EPA Minor Comment 1	**<u>Section 2.3.4, Chain-of-Custody, Page 34</u>: The bulleted list on this page is missing information regarding what items field personnel are required to include on the chain-of-custody (COC). Please include a bullet identifying that the sample matrix will need to be included on the COC.**
Response:	The bullet has been added as requested.
EPA Minor Comment 2	**<u>Table 7, Proposed Data Gap Samples, Rationale, and Analyses, Page 30</u>: It appears that this table contains a typo. The four locations selected to confirm the presence of mercury near WHSSB022 appear to be shown on Figure 4, not Figure 3. Please revise the table.**
Response:	The reference has been corrected.

COMMENTS FROM THE RWQCB

The RWQCB comments were presented in a letter dated September 3, 2004.

RWQCB General Comment 1	**The Navy needs to clarify in the document how the proposed data gap sampling will aid in addressing remediation, monitoring and management of the impacted sites.**
Response:	The additional site characterization under this SAP will provide data to assist in reassessing site risks and evaluating prospective remedial alternatives in an FS. A statement to that effect has been added to Section 1.0 of the SAP.
RWQCB General Comment 2	**Water Board staff considers that data gaps remain at the sites as follows:** **1. The RMEs (Reasonable Maximum Exposure) cancer risks (industrial exposure scenario) were above 10-6 for either PAHs, PCBs, dioxin and furans in soils. Please further sample for these analytes at the Wood Hogger Site, the R Area Site, the Froid and Taylor Road Sites near where these pollutants were originally detected and define their vertical and lateral extent.**

2. **Please sample for emergent chemicals: Perchlorate, n-Nitrosodimethylamine (NDMA), 1,4-Dioxane, 1,2,3-Trichloropropane, Chromium VI, and Polybrominated Diphenyl Ether (PBDE) in surface/ ground water at the sites per the SWRCB's (State Water Resources Control Board) letter to the U.S. Navy on July 3rd 2003. If not sampling for these chemicals please explain why.**
3. **Detections of petroleum constituents in soils and surface water at the sites above regulatory standards need to be defined laterally and vertically. Provide isoconcentration maps showing petroleum detections in groundwater, surface water, and soils at the sites.**
4. **Determine the lateral extent of the 1 cm of the "brownish oily substance"1 in the soils at soil boring WHSSB2011.**
5. **There is a high probability of preferential flow pathways to the deeper aquifers and Suisun Bay as evidenced by the existence of an estuarine micaceous sand aquifer found below the alluvial clays which might be impacted by and convey the contaminants originating from the sites currently under review. Studies of properties east of the CNWS (Concord Naval Weapons Station) Litigation Area document impairment to this aquifer from industrial activities at the ground surface. Please sample the deeper aquifer for any contaminants detected in the shallower aquifer.**

Response:

1. The Navy disagrees with RWQCB's request for additional sampling in light of conditions at the site, especially when the calculated carcinogenic risk is considered. A summary of residential risk calculations for each site is presented below. Although industrial risk is not summarized in the following paragraphs, the risks under the industrial worker scenario are lower.

   a. In Site 2, the maximum calculated carcinogenic risk under the residential exposure scenario is 5 x 10^{-5}. The risk is mostly attributable to arsenic at concentrations that are only slightly higher than estimated ambient concentrations. The segregated (segregated for each target organ, such as liver, kidneys, and skin) hazard index (HI) for the residential exposure scenario was less than 1 for soil, and the HI for surface water was also less than 1. The source of arsenic has not been identified, but no information suggests a source associated with soil contamination.

   b. The maximum calculated residential exposure scenario carcinogenic risk is 1 x 10^{-5} at Site 9. The risk is attributable to benzo(a)pyrene at concentrations consistent with background in northern California, and to polychlorinated biphenyl (PCB)-126 (PCB-126 residential cancer risk was 3 x 10^{-6}). All HIs were less than 1 for the residential exposure scenario

c. The maximum residential carcinogenic risk is 9 x 10^{-5} at the Site 11. This risk is mostly associated with dioxins. The HI for soil was equal to 1, the threshold of concern, for the residential exposure scenario, while the HI for surface water was less than 1.

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) discusses acceptable risks at 40 Code of Federal Regulations (CFR) 300.430(e)(2)(i)(A)(2). The NCP sets the "acceptable exposure level" for carcinogens between 10^{-4} and 10^{-6} (based on the residential exposure scenario). Although the estimated site risks are within this acceptable range, the Navy is sensitive to the agencies' concerns and has therefore agreed to (1) conduct this data gap sampling, and (2) carry Sites 2, 9, and 11 through a full FS.

2. Further evaluation of the risk drivers for human health is not justified. RWQCB issued a letter to Mr. David Baillie, environmental director, Naval Weapons Station Seal Beach on July 3, 2003, requesting investigation of "emergent chemicals" including n-nitrosodimethylamine, 1,4-dioxane, 1,2,3-trichloropropane and polybrominated diphenyl ether. The Navy responded to Ms. Loretta K. Barsmanian, executive officer, RWQCB, in a letter from the Commanding Officer, Naval Weapons Station Seal Beach, dated March 1, 2004. As with any constituents, these chemicals are included among analytes at the Tidal Area sites, or elsewhere at Naval Weapons Station Seal Beach, Detachment Concord (NWS SBD–Concord) according to the likelihood that the constituents are present based on historical data and existing laboratory data for the site. The following provides the Navy's response for each chemical analysis in surface water and groundwater requested by RWQCB staff:

Perchlorate

The Navy collected and analyzed groundwater samples in the vicinity of Site 1, the Tidal Area Landfill, in July 2003 to evaluate whether perchlorate is present. Perchlorate was not detected in the groundwater samples, but the quantitation limits for the samples were elevated because of matrix interference from high levels of common anions.

Common anions (chloride, sulfate, and carbonate) were present in the samples at high concentrations because the groundwater samples in the Tidal Area are saline. Common anions cause peak interference with any perchlorate present. Common anions therefore distort the baseline in the retention time window for perchlorate and impair accurate quantitation of perchlorate. The samples were diluted to dilute common anions, which resulted in elevated sample quantitation limits for perchlorate. The Navy has discussed the situation with the laboratory, and lower quantitation limits may be possible in the future.

Although the results from previous groundwater sampling were inconclusive due to the elevated quantitation limits, the Navy intends to include perchlorate in future groundwater sampling near Site 1, the Tidal Area Landfill. The Navy plans further discussion with the laboratories and evaluation of methods to reduce the quantitation limits.

Chromium VI

Various media were sampled for analysis of total chromium, and some samples were analyzed for hexavalent chromium. Screening criteria for total chromium assume the presence of hexavalent chromium. Human health and ecological risk at the site are not driven by concentrations of chromium, so the existing site characterization for chromium is considered adequate.

NDMA

N-nitrosodimethylamine (NDMA) is a yellow liquid that has no distinct odor. It is produced in the U.S. only for use as a research chemical. NDMA was used to make rocket fuel, but this use was stopped after unusually high levels of this compound were found in air, water, and soil samples collected near a rocket fuel manufacturing plant (ATSDR Tox Profile 141).

NDMA may have been present in missiles that were stored at the facility, but the Navy has no knowledge that NDMA was otherwise used in any process at the site.

When NDMA is released into the atmosphere, it breaks down in sunlight in a matter of minutes. When released to soil, NDMA may evaporate into air, break down on exposure to sunlight, or sink into deeper soil. NDMA should break down within a few months in deep soil. When NDMA is released into water, it may break down on exposure to sunlight or by natural biological processes (ATSDR Tox Profile 141)

The Navy considers a source of NDMA to be highly unlikely at Sites 1, 2, 9, and 11 because NDMA is not a known process chemical or research chemical at NWS SBD Concord, and also because NDMA typically breaks down rapidly. As such, the Navy does not plan to analyze for NDMA.

1,4 Dioxane

1,4 Dioxane is a clear liquid that dissolves in water at all concentrations. It is used primarily as a solvent in the manufacture of chemicals and as a laboratory reagent; 1,4 dioxane also has various other uses that take advantage of its solvent properties (ATSDR ToxProfile 187). Because of the frequent use of solvents at NWS SBD Concord, 1,4 dioxane seems a likely product to have been used at NWS SBD Concord in other solvents. As a result, the Navy plans to include 1,4 dioxane in the list of analytes for groundwater analysis near the Tidal Area Landfill (Site 1). However, since analysis of groundwater is not the focus of this SAP, the requested analysis will be included only in the draft final SAP for Additional Groundwater Investigation at Tidal Area Landfill, Site 1.

1,2,3-Trichloropropane

1,2,3-Trichloropropane is a synthetic chemical that is also known as allyl trichloride, glycerol trichlorohydrin, and trichlorohydrin. It is a colorless, heavy liquid with a sweet but strong odor. It evaporates quickly and small amounts dissolve in water (ATSDR ToxFAQ 57).

It is mainly used to make other chemicals. Some of it is also used as an industrial solvent, paint and varnish remover, and cleaning and degreasing agent. Very little information is available on the amounts manufactured and the specific uses (ATSDR ToxFAQ 57).

The Navy is not aware of any former use of 1,2,3-trichloropropane at NWS SBD Concord. Because the Navy does not suspect that 1,2,3 trichloropropane was formerly used at NWS SBD Concord, the Navy does not plan to analyze groundwater for that constituent.

Polybrominated Diphenyl Ethers

Polybrominated diphenyl ethers (PBDEs) are manmade chemicals found in plastics used in a variety of consumer products to make them difficult to burn. PBDEs have not been identified in any of the 1,613 National Priorities List sites EPA has identified (ATSDR ToxFAQ 68).

Because they are mixed into plastics rather than bound to them, they can leave the plastic and find their way into the environment. PBDE is a colorless to off-white solid. PBDEs is a mixtures of up to 209 individual component chemicals called congeners (ATSDR ToxFAQ 68).

Because the Navy does not suspect that PBDE was formerly used at NWS SBD Concord as process chemicals, the Navy does not plan to analyze groundwater for PBDE.

Please note that groundwater will not be sampled and analyzed as part of the Tidal Area Sites Data Gaps SAP. Instead, proposed groundwater sampling and analysis will be conducted as part of the Additional Groundwater Investigation at the Tidal Area Landfill, Site 1. The sampling and analysis is described in the draft final version of the SAP for Additional Groundwater Investigation at the Tidal Area Landfill, Site 1.

3. Petroleum constituents were not raised as chemicals of concern during the Navy's meetings with the agencies, and the Navy is not of the opinion that data gaps exist for petroleum constituents at the sites. Although petroleum constituents are not regulated under CERCLA, hazardous constituents that make up petroleum products are regulated and were included in most analyses at the sites. The Navy will discuss petroleum constituents in the revised RI report and will provide characterization maps, as appropriate. Isoconcentration contour maps may also be presented if meaningful contours can be prepared.
4. Free product that resembled motor oil was detected in gravels at a depth of approximately 2 feet below the ground surface in boring WHSSB201. Three additional borings were drilled in the vicinity of WHSSB201to

investigate the extent of free product. Boring WHSSB202 was drilled 3 feet south of boring WHSSB201; boring WHSSB203 was drilled 5 feet north of WHSSB201; and boring WHSSB204 was drilled 5 feet west of boring WHSSB201.

Although soil in boring WHSSB202 smelled of hydrocarbons, neither free product nor motor oil was observed in this boring. A black tar-like substance was observed mixed with gravel in boring WHSSB203 at a depth of 4.5 feet below grade. Weekly Quality Control Report No. 009 indicated that the black tar-like substance was probably from a former roadway and not necessarily indicative of motor oil. The brownish oil substance detected in boring WHSSB201 was dissimilar to the jet-black, tar-like substance detected in boring WHSSB203. Although the Weekly Quality Control Report No. 009 indicated that soil in boring WHSSB204 had a slight smell of hydrocarbons, motor oil was not visually observed in this boring.

Hydrocarbon contamination detected in boring WHSSB201 is not laterally extensive, as indicated by three borings drilled within 3 to 5 feet of WHSSB201. The Navy believes that the extent of hydrocarbons has been adequately delineated and that there is no data gap that would require additional investigation.

5. Although industrial processes at and to the east of the Litigation Area were responsible for contaminating significant large tracts of land, little, if any, significant contamination of soil and groundwater has been found in at the Tidal Area Sites.

   The Tidal Area Sites RI (TtEMI 2003) and the Groundwater Sampling Summary Report for the Tidal Area Landfill, Site 1, (TtEMI 2004a) conclude that Tidal Area Sites 1, 2, 9, and 11 are not affected by volatile or semivolatile organic compounds.

   Naturally occurring inorganic constituents have been detected at various concentrations in samples from the Tidal Area wells. The variations in concentrations of these inorganic constituents is not unexpected based on several factors, including variations in groundwater pH, oxygen reduction potential, dissolved oxygen, depth of the screened interval, and differences in geology (such as fill thickness). However, in evaluating Sites 2, 9, and 11, no data have been obtained to suggest that the observed variations in concentrations of metals in groundwater are a result of inorganic contamination in soils, nor have data been obtained that suggest that groundwater at the site is contaminated.

   Groundwater elevations in the Tidal Area Sites were depressed to form a groundwater sink, based on past measurements. Unless deeper aquifers were pumped and thus depleted, a downward vertical hydraulic gradient from shallow groundwater to a deeper aquifer is unlikely. (Water levels in the wells were already recorded at elevations below sea level.) Even if groundwater elevations in the lower aquifers were lower than were measured in shallow wells at the site, the Bay Mud forms a significant and effective aquitard.

Although Site 2 was flooded during former measurements of groundwater at the site, shallow groundwater levels responded very slowly to changes in surface water elevations. These observations demonstrate the relative impermeability of the Bay Mud aquitard.

The Site 1 SAP for Additional Groundwater Investigation at Tidal Area Landfill, Site 1, includes investigation of the underlying Bay Mud aquitard to estimate its hydraulic conductivity (see Section 2.2.5 of the SAP). Slug testing is proposed in existing wells TLSMW006 and RAPZ006, and in proposed wells TLSMW008, TLSMW009, TLSMW010, TLSMW011, and TLSMW012. Hydraulic conductivity information from these wells will be added to the information already generated for other wells at the site (TLSMW001, TLSMW003, TLSMW005). The data from these wells will be presented in the Draft Site 1 Additional Groundwater Investigation Report.

The Navy does not believe there is significant risk to lower aquifers as a result of contaminants at the Tidal Area sites because the geologic conditions are not conducive for contaminants to vertically migrate to lower aquifers and because groundwater testing to date has not suggested contamination. As such, the Navy does not believe that a data gap is associated with groundwater conditions in lower aquifers.

RWQCB Specific Comment 1

Section 1.1.2.2, Mercury in Sediment at Site 11, p 4:

- **Provide the HQ (Hazard Quotient) for Nickel at the site.**
- **Please add subsurface samplings for a subset of samples at the site to determine the vertical extent of contaminant distribution.**
- **Please clarify the basis for not sampling mercury in surface water at the site.**

Response:

- The hazard quotient associated with nickel in sediment at Otter Slough is 3.85. For more information on nickel detected in Otter Slough, please see response to EPA Specific Comment No. 3.
- Subsurface samples to characterize the vertical extent of mercury have been added to the draft final SAP, as requested. See response to EPA Specific Comment No. 4.
- Surface water samples will not be collected for analysis of mercury because the daily tidal flushing of Otter Slough obscures the source of any mercury detected in the water body. If mercury detected in sediment samples from within and around Otter Slough indicates degradation of surface water quality, the problem will require further study and evaluation of remedial actions in an FS. As a result, surface water will not be sampled, but sediment samples will be collected as indicated in the SAP.

COMMENTS BY THE U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife comments were presented in a letter dated August 11, 2004.

USFWS Major Concern 1	**The Service recommends additional surface and sub-surface sampling to characterize lateral and vertical extent of mercury contamination at the Wood Hogger Site.**
Response:	The Navy concurs that additional surface and subsurface sampling is required to characterize the lateral and vertical extent of mercury at the Site 11. All transect and step-out samples will be collected at the surface. Subsurface samples (8 to 16 inches and 16 to 24 inches) will be collected and archived for possible analysis. Subsurface samples will be analyzed if concentrations of mercury in surface samples indicate concentrations exceed the Tidal Area ambient concentration for mercury. Please see response to EPA Specific Comment 4 for additional discussion.
USFWS Major Concern 2	**The Service recommends additional sampling for dioxins and furans at the Wood Hogger Site.**
Response:	Please see response to EPA General Comment 1 and Specific Comment 1.
USFWS Major Concern 3	**The Service is concerned that the proposed analytical method for mercury is not sufficiently sensitive.**
Response:	The Navy proposes a standard method (EPA 7471A) to analyze mercury in sediment and assumes that 100 percent of the detected mercury is methylated. The Navy has revised the table with the correct PRRL for mercury. The revised PRRL for mercury is 0.20 mg/kg. The revised PRRL for mercury is lower than the ER-M (0.71 mg/kg).
USFWS Major Concern 4	**The proposal to screen analytical results against ER-M values may not be protective of higher trophic level organisms that bioaccumulate mercury and organochlorine pesticides**
Response:	The USFWS is correct in that ER-Ms are not appropriate screening tools for higher trophic level receptors. The ERA evaluated risk to higher trophic level receptors using food chain modeling that incorporated site data as well as conservative assumptions about bioaccumulation. No unacceptable risk to higher trophic level organisms was predicted based on the baseline ERA (BERA).
USFWS Specific Comment 1	**Page 4. In the Navy's response to EPA's comments regarding dioxin and furan contamination at the Wood Hogger site (dated January 29, 2004), the Navy stated they "will prepare a sampling and analysis plan to more precisely delineate and characterize the extent of PCDD/PCDF at the Wood Hogger Site." Please explain why that proposed sampling for dioxins and furan contamination was not included in this plan. In addition, the data on dioxin and furan contamination should be converted to toxic equivalent factors so the potential impact to ecological receptors can be assessed more accurately.**

Response:	Please see response to EPA General Comment 1 and Specific Comment 1.
USFWS Specific Comment 2	**<u>Page 4</u>. Please include the concentrations of pesticides measured for sample location FTSSL102**
Response:	Alpha-chlordane was detected at 11.0 parts per billion (ppb); gamma-chlordane at 12 ppb, and DDT at 18 ppb. Total DDTs were calculated at 43.2 ppb. Neither dieldrin nor endrin was detected. Hazard quotients associated with these concentrations are shown in Table 5-7 of the BERA. The text of the SAP has been revised to include this detail.
USFWS Specific Comment 3	**<u>Pages 4 and A-1</u>. Please correct the value cited for the ER-M for mercury to 0.710 mg/kg, dry weight.**
Response:	The correction has been made.
USFWS Specific Comment 4	**<u>Pages 6, 16</u>. Please clarify the relative locations of samples WHSSB022 and WHSSBA08 described in the text as "adjacent" but appearing to be approximately 25 feet away from each other on Figure 4.**
Response:	The text has been revised to clarify the relative location of these two samples.
USFWS Specific Comment 5	**<u>Page 7</u>. The Service suggests that transects for mercury be re-located from being evenly spaced to being aligned with the previous sample locations with elevated mercury contamination. For example, transect 4 already is aligned with sample location WHSSBOl8, but transect 3 would be moved so that it runs through sample location WHSSBAO6. This placement of the transects would provide more information about the extent of mercury contamination and the relationship between the "hotspots" and Otter Sluice.**
Response:	The EPA requested revised locations of transects, and the Navy has adjusted the locations based on the actual configuration of the Otter Slough channel and EPA comments. The proposed sampling of transects has been revised to focus on the conditions within Otter Slough and on the banks of Otter Slough. Please also see response to EPA Specific Comment No. 4. Sampling in the vicinity of the hotspots and between the hotspots and Otter Slough has been increased as indicated on Figure 6.
USFWS Specific Comment 6	**<u>Page 7.</u> The Service suggests that additional sampling between the four sample locations with mercury concentrations greater than 1 mg/kg is needed and will not be completely accounted for by the transects across Otter Sluice. The Service recommends adding a transect through the four samples with mercury concentrations greater than 1 mg/kg and extending at least 50 feet beyond WHSSBAO6 and WHSSB022 at the ends. Samples would be collected every 50 feet or less along the transect. A revision to the Otter Sluice transect proposal to collect samples at locations that intersect the Service's proposed transect could minimize the number of additional samples required.**

Response:	The Navy has reviewed both EPA's recommended revised sampling and the additional sampling recommended by USFWS. Please see Figure 6 of the revised SAP for the new sample locations.
USFWS Specific Comment 7	**<u>Pages 7 and 9</u>. The text on the figure refers to step-out locations within 10 feet of the original sample location, but the text on page 9 says they will be within 1 foot. Please clarify.**
Response:	The text and figure have been revised to be consistent, and the new step-out distance is 10 feet.
USFWS Specific Comment 8	**<u>Page 8</u>. Please note the range of widths for Otter Sluice in this region as it relates to likely distance between the three bottom samples.**
Response:	The width of Otter Slough varies. Please see Figure 4, which presents an aerial photograph of the site and the location of transects. The sample locations illustrated on Figure 5 will be closer together for narrow portions of the slough; the sample locations will be farther apart for relatively wide sections of the slough. The sample locations will be evenly spaced at each transect, as illustrated schematically on Figure 5. A professional land surveyor will measure the width of Otter Slough at each location and will establish ground surface topography as well as bathymetry.
USFWS Specific Comment 9	**<u>Page 9</u>. Please include sample location WHSSB024 with 7.1 mg/kg mercury to the list of sample locations with elevated mercury around which step-out samples will be taken.**
Response:	The location of WHSSB024 has been added, as requested.
USFWS Specific Comment 10	**<u>Pages 9, 29, 30</u>. Although the Navy states that the intent of the sampling is to evaluate existing conditions and prepare for remedial actions, if needed, no subsurface sampling is proposed. Therefore, the proposed sampling will not address the vertical extent of mercury contamination. At a minimum, the Service recommends adding samples at 1.5 and 3 foot below ground surface below the original four locations. In addition, it may be prudent to collect sub-surface samples at other proposed locations and subsequently analyze them if the associated surface sample has elevated mercury concentrations**
Response:	Please see response to USFWS Major Concern 1.
USFWS Specific Comment 11	**<u>Pages 14, 16.</u> ER-M values predict benthic invertebrate toxicity, but do not address toxicity to other organisms. Mercury and pesticides bioaccumulate in higher trophic level organisms and potential adverse effects may occur, particularly for birds, at concentrations below the respective ER-M values. Please include other ecological benchmarks that address potential effects to higher trophic levels or use appropriate ambient levels to screen the results.**
Response:	Please see response to USFWS Major Concern 4.

USFWS Specific Comment 12 — **Page 14. Please revise the reference to three locations with elevated mercury to four locations as shown on page 7.**

Response: This correction has been made.

USFWS Specific Comment 13 — **Pages 16, 29, A-1. Please analyze samples for the ortho and para isomers of dichlorodiphenyltrichloroethane (DDT) and its metabolites, dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethene (DDE). The total DDTs values (the sum of all six chemicals) should be compared to ecological DDTs, in addition to comparisons for each chemical individually.**

Response: As indicated in Table 8 of the SAP, samples collected at Site 9 will be analyzed for pesticides using EPA Method 8081A, which includes the ortho and para isomers of DDT, DDD, and DDE. ER-Ms are available for the 4,4' congeners but not for the 2,4' congeners. Wherever ecological benchmarks are available, the results will be screened against the appropriate value. Total DDT (for the sum of six DDT chemicals) will be compared to the ER-M for total DDTs. Table 3 and A-1 of the SAP now include the ER-M for total DDTs.

USFWS Specific Comment 14 — **Page 19. Please reference Table A- 1 as the location where the actual numbers are presented.**

Response: The SAP has been updated with the requested reference.

USFWS Specific Comment 15 — **Page A-1. The project reporting limit presented for mercury of 20 mg/kg greatly exceeds the correct ER-M value of 0.7 10 mg/kg and is higher than any of the previous sample results. Please select an analytical method that can detect and accurately quantify total mercury to below 0.5 mg/kg.**

Response: Please see response to USFWS Major Concern 3.

USFWS Specific Comment 16 — **Page A-1. As mentioned above, please analyze for all six DDT, DDD, and DDE compounds and include their respective reporting limits.**

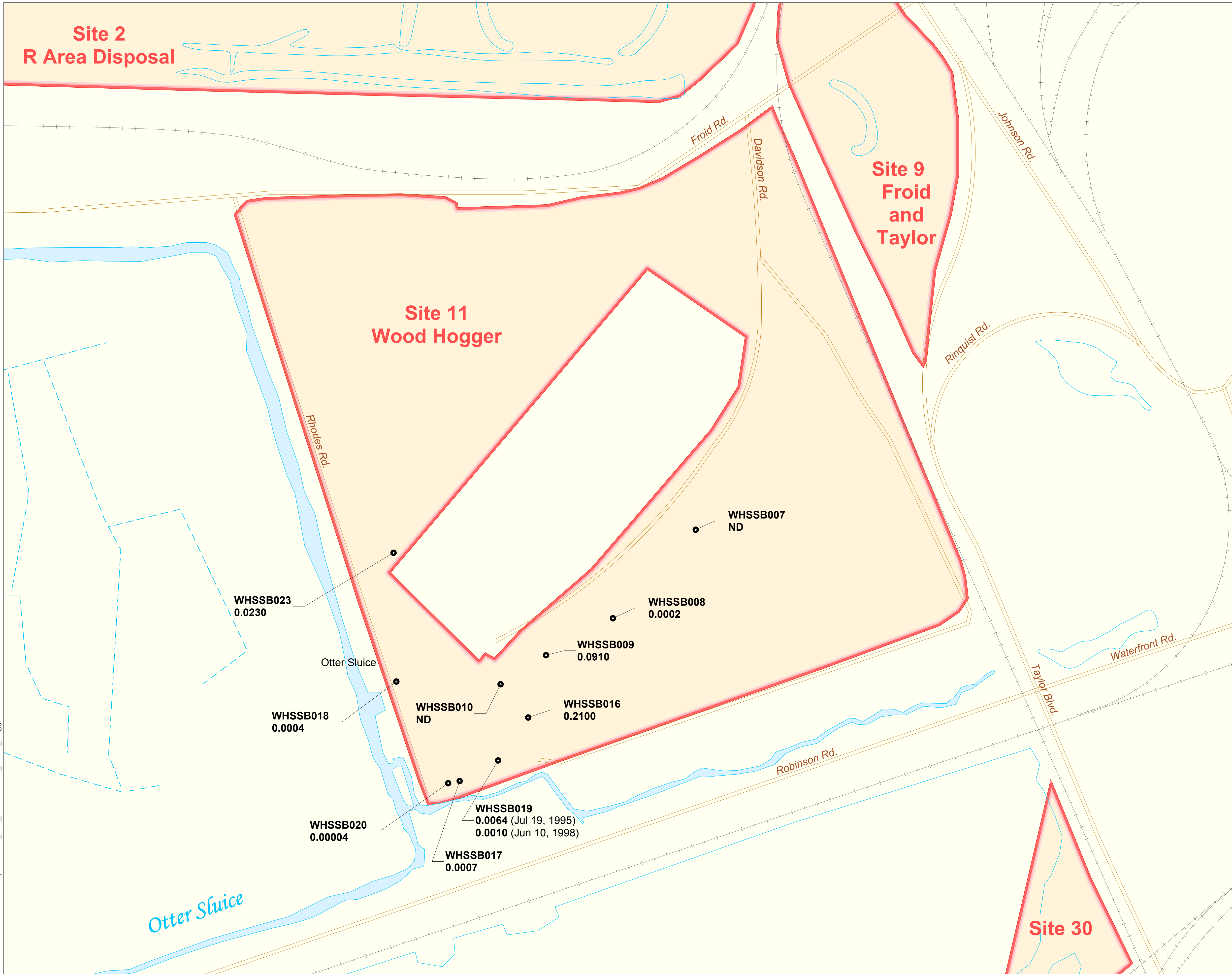
Response: Please see response to USFWS Specific Comment 13. Reporting limits are specified in the revised SAP.

COMMENTS BY CA DFG-OSPR

DFG-OSPR comments were presented in a letter dated September 15, 2004.

DFG-OSPR General Comment 1	**The California Department of Fish and Game, Office of Spill Prevention and Response (DFG-OSPR) appreciates the opportunity to comment on the subject document. This document identifies gaps in the data from the Remedial Investigation (RI) Report, dated August 8, 2003. Consequently, these comments will relate to both reports.** **We do not believe that the document has addressed all of the issues that we commented on in our October 23, 2003 memorandum (attached). The DFG-OSPR believes that some of these issues should have been identified as data gaps. In that memo, we identified a potential problem with the calculation of the ambient concentrations. We questioned the appropriateness of use of the 95% upper confidence level for determination of ambient conditions. We wish to reiterate those concerns.**
Response:	The Navy responded to DFG-OSPR comments on the RI in draft form on January 29, 2004, and requested agency feedback on the Navy's draft responses. The Navy did not receive additional questions or comments from DFG-OSPR after the Navy issued the draft responses to agency comments on January 29, 2004; thus, the Navy has assumed the draft responses were satisfactory. The Navy believes that the former responses to DFG-OSPR's comments remain valid, and should be acceptable to DFG-OSPR. With regard to the 95th percent upper confidence level, the following response was provided to DFG-OSPR in the draft responses on January 29, 2004. *"Response to DFG_OSPR General Comment 2:* As described in Appendix I of the RI report, the methodology involved removing outliers from the data set and also involved review of variations in inorganic concentrations with depth. The ambient data set is not a simple 95th percentile of all samples.*"*
DFG-OSPR General Comment 2	**The January 2002 Revised draft final Ecological Risk Assessment included the northern harrier, great blue heron, black rail, river otter, salt marsh harvest mouse, and the gray fox as ecological receptors for risk analysis. The DFG-OSPR concurs with the use of these receptors at Sites 2, 9, and 11.**
Response:	Comment noted.
DFG-OSPR General Comment 3	**It is important to establish compatibility in the naming of the site locations. We recommend that the sites simply be described as 2, 9, and 11. Alternate names are provided within the subject document, and also in the August 8, 2003 RI document. A consistent naming convention will aid clarity.**
Response:	Future versions of the RI will refer to these Sites as 2, 9, and 11.

DFG-OSPR Specific Comment 1	**<u>Page 4, 1.1.2.1</u>: We acknowledge the presence of pesticides at location FTSSLI 02 and potential risk to receptors. Rather than just analyzing p,p-DDT, however, please add DDD, DDE, and sum them with DDT for a Total DDT value in each sample. Additionally, bioaccumulative chemicals such as these need more evaluation than just comparison to an Effects Range-Median (ER-M). An evaluation of risk to higher trophic level receptors will be needed.**
Response:	Regarding DDT, please see response to USFWS Specific Comment 13. Risk to higher trophic level predators was assessed using a food chain model that includes direct and indirect measures of bioaccumulation (TtEMI 2002). Food-chain modeling indicated no unacceptable risk to birds (represented by the northern harrier and black-necked stilt) in the Froid and Taylor Roads wetland. All hazard quotients for pesticides were less than 1.0 using both the high and low toxicity reference values (TRV). The DQOs have been modified to indicate that if DDT concentrations detected in sediment are higher than the UCL_{95} concentration used in the food-chain model, then risk to upper trophic level receptors will be re-evaluated. Converselyl, if DDT concentrations detected in sediment are lower than the UCL_{95} concentration used in the food-chain model, then risk to upper trophic level receptors will not require re-evaluation.
DFG-OSPR Specific Comment 2	**<u>Pages 4 to 6, Section 1.1.2.2</u>: We concur with the goal of assessing the variability of mercury samples. However, the Effects Range-Median (ER-M) value for mercury is not 218 mg/kg, as is stated here, but rather it is 0.71 mg/kg, dry weight. Because mercury bioaccumulates, adverse impacts from mercury to receptors at higher trophic levels should also be analyzed.**
Response:	The error in the ER-M has been corrected. The calculations used the correct value. Risk to higher trophic level predators was assessed using a food chain model that includes direct and indirect measures of bioaccumulation.
DFG-OSPR Specific Comment 3	**<u>Page 14</u>*:* Technical or Regulatory Standards: As we mentioned previously, mercury is a bioaccumulative chemical, so the ER-M alone is not a sufficient benchmark to protect higher trophic level receptors. Therefore, it is also not a sufficient action level.**
Response:	Please see response to Specific Comment 2. The Navy is not proposing any action levels at this time.
DFG-OSPR Specific Comment 4	**<u>Page 16, Table 3</u>: Data Quality Objectives: As previously stated above, the pesticides and mercury data needs evaluation beyond just ER-M benchmark comparisons, and so the Decision Rules stated here in step 5 should be expanded to reflect this.**
Response:	This table has been revised to reflect the food chain modeling approach to risk assessment of bioaccumulative chemicals.



Legend:

- Sampling Locations
- Site Boundaries
- Mosquito Ditches
- Roads
- Railroads

Notes:
1. Results in micrograms per kilogram.
2. ND - Dioxins and furans not detected.
3. Samples will be collected from a depth of 0 to 0.5 feet below ground surface.

Tetra Tech EM Inc.

NAVAL WEAPONS STATION SEAL BEACH DETACHMENT
CONCORD, CALIFORNIA
Integrated Product Team West, Daly City

FIGURE H-1
DIOXIN CONCENTRATIONS IN SOIL
WOOD HOGGER SITE
TIDAL AREA

Tidal Area Data Gaps Investigation SAP

2005-03-14 V:\Concord\Projects\Tidal_GW_Invest\Dioxin_Wood_Hogger.mxd TtEMI-SF Aleksandr Zhuk

TABLE H-1
ANALYTICAL RESULTS FOR DIOXIN ANALYSIS
SITE 11, WOOD HOGGER SITE
TIDAL AREA
NAVAL WEAPONS STATION SEAL BEACH, DETACHMENT CONCORD
CONCORD, CALIFORNIA

SAMPLE IDENTIFICATION	WHSSB007		WHSSB008		WHSSB009		WHSSB010		WHSSB016		WHSSB017		WHSSB018		WHSSB019		WHSSB019		WHSSB020		WHSSB023	
DATE	10-Jun-98		10-Jun-98		10-Jun-98		10-Jun-98		10-Jun-98		10-Jun-98		10-Jun-98		19-Jul-95		10-Jun-98		19-Jul-95		10-Jun-98	
ANALYTE	RESULT	Q	RESULT	Q	RESULT	Q	RESULT	Q	RESULT	Q	RESULT	Q	RESULT	Q	RESULT	Q	RESULT	Q	RESULT	Q	RESULT	Q
1,2,3,4,6,7,8,9-OCDD	2	U	2	J	100	J	1	U	140	J	7	J	4	J	3.8		10	J	0.36	J	9	J
1,2,3,4,6,7,8,9-OCDF	1	U	1	U	5	J(EM)	0.7	U	13	J	1	U	0.6	U	0.23	U	1	U	0.083	U	0.5	J
1,2,3,4,6,7,8-HPCDD	2	U	2	U	8	J	1	U	16	J	1	U	0.8	U	0.47		1	U	0.056	U	2	J
1,2,3,4,6,7,8-HPCDF	0.5	U	0.6	U	2	J	0.3	U	3	J	0.4	U	0.3	U	0.13	J	0.4	U	0.08	U	0.2	J
1,2,3,4,7,8,9-HPCDF	0.6	U	0.8	U	1	U	0.4	U	2	U	0.6	U	0.4	U	0.04	U	0.6	U	0.08	U	0.4	U
1,2,3,4,7,8-HXCDD	1	U	1	U	1	U	0.8	U	2	U	0.8	U	0.5	UJ	0.048	U	0.6	U	0.066	U	0.8	U
1,2,3,4,7,8-HXCDF	0.3	U	0.3	U	0.6	U	0.2	U	0.7	U	0.3	U	0.2	U	0.023	U	0.3	U	0.055	U	0.2	U
1,2,3,6,7,8-HXCDD	1	U	1	U	1	U	0.8	U	2	U	0.8	U	0.5	U	0.048	U	0.6	U	0.066	U	0.7	U
1,2,3,6,7,8-HXCDF	0.3	U	0.3	U	0.6	U	0.2	U	0.6	U	0.2	U	0.2	U	0.023	U	0.3	U	0.055	U	0.2	U
1,2,3,7,8,9-HXCDD	1	U	1	U	1	U	0.8	U	2	U	0.8	U	0.5	UJ	0.048	U	0.6	U	0.066	U	0.7	U
1,2,3,7,8,9-HXCDF	0.4	U	0.4	U	0.7	U	0.2	U	0.8	U	0.3	U	0.2	UJ	0.023	U	0.3	U	0.055	U	0.3	U
1,2,3,7,8-PECDD	0.5	U	0.5	U	1	U	0.2	U	0.9	U	0.4	U	0.7	U	0.084	U	0.5	U	0.055	U	0.9	U
1,2,3,7,8-PECDF	0.3	U	0.3	U	0.4	U	0.2	U	0.4	U	0.2	U	0.2	U	0.086	U	0.2	U	0.039	U	0.3	U
2,3,4,6,7,8-HXCDF	0.3	U	0.4	U	0.6	U	0.2	U	0.7	U	0.3	U	0.2	U	0.023	U	0.3	U	0.055	U	0.2	U
2,3,4,7,8-PECDF	0.3	U	0.3	U	0.4	U	0.2	U	0.4	U	0.2	U	0.2	U	0.086	U	0.2	U	0.039	U	0.3	U
2,3,7,8-TCDD	0.3	U	0.3	U	0.7	U	0.1	U	0.6	U	0.3	U	0.4	U	0.015	U	0.3	U	0.03	U	0.5	U
2,3,7,8-TCDF	0.2	U	0.2	U	0.3	U	0.1	U	0.3	U	0.1	U	0.1	U	0.062	U	0.1	U	0.099	U	0.2	U
Dioxin (TEQ)	--		0.0002		0.091		--		0.21		0.0007		0.0004		0.0064		0.0010		0.00004		0.023	

Notes: All samples were collected from the surface.
All sample results reported in micrograms per kilogram
Q = Qualifier
U = Not Detected
J = Estimated
J(EM) = Estimated (Estimated Maximum Possible Concentration)
-- = TEQ not calculated because dioxins and furans not detected
TEQ = Toxicity Equivalency Quotient

TABLE H-2
ANALYTICAL RESULTS FOR DIOXIN ANALYSIS
OTTER SLOUGH
TIDAL AREA
NAVAL WEAPONS STATION SEAL BEACH, DETACHMENT CONCORD
CONCORD, CALIFORNIA

SAMPLE IDENTIFICATION	OSLSL005		OSLSL006		OSLSL007		OSLSL008	
DATE	10-Jun-98		10-Jun-98		10-Jun-98		10-Jun-98	
ANALYTE	RESULT	Q	RESULT	Q	RESULT	Q	RESULT	Q
1,2,3,4,6,7,8,9-OCDF	0.9	U	1	U	1	U	2	U
1,2,3,4,6,7,8-HPCDD	1	U	2	U	2	U	3	U
1,2,3,4,6,7,8-HPCDF	0.4	U	0.7	U	0.5	U	1	U
1,2,3,4,7,8,9-HPCDF	0.5	U	0.9	U	0.7	U	2	U
1,2,3,4,7,8-HXCDD	0.7	U	1	U	0.9	U	2	U
1,2,3,4,7,8-HXCDF	0.2	U	0.4	U	0.3	U	0.7	U
1,2,3,6,7,8-HXCDD	0.7	U	1	U	0.9	U	2	U
1,2,3,6,7,8-HXCDF	0.2	U	0.4	U	0.3	U	0.7	U
1,2,3,7,8,9-HXCDD	0.7	U	1	U	0.9	U	2	U
1,2,3,7,8,9-HXCDF	0.3	U	0.5	U	0.4	U	0.9	U
1,2,3,7,8-PECDD	0.5	U	1	U	0.6	U	2	U
1,2,3,7,8-PECDF	0.3	U	0.5	U	0.4	U	0.8	U
2,3,4,6,7,8-HXCDF	0.2	U	0.4	U	0.3	U	0.7	U
2,3,4,7,8-PECDF	0.3	U	0.5	U	0.4	U	0.8	U
2,3,7,8-TCDD	0.3	U	0.6	U	0.3	U	1	U
2,3,7,8-TCDF	0.2	U	0.3	U	0.3	U	0.6	U
Dioxin (TEQ)	--		--		--		--	

Notes: All sediment samples were collected from the sediment surface.
All sample results reported in micrograms per kilogram.
Q = Qualifier
U = Not Detected
J = Estimated
-- = TEQ not calculated because dioxins and furans not detected
TEQ = Toxicity Equivalency Quotient

REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). ToxProfile 141. http://www.atsdr.cdc.gov/toxprofiles/tp141-c1.pdf

ATSDR. ToxProfile 187. http://www.atsdr.cdc.gov/toxprofiles/tp187.html

ATSDR. ToxFAQ 57. http://www.atsdr.cdc.gov/tfacts57.html

ATSDR. ToxFAQ 68. http://www.atsdr.cdc.gov/tfacts68.html

Tetra Tech EM Inc (TtEMI). 2002. "Revised Draft Final Ecological Risk Assessment, Tidal Area Sites 2, 9, and 11, Naval Weapons Station, Seal Beach Detachment, Concord, California." January.

TtEMI. 2003. "Revised Draft Remedial Investigation, Tidal Area Sites 2, 9, and 11, Naval Weapons Station, Seal Beach Detachment, Concord, California." August 8. (Status of this document was changed to Draft per U.S. Navy letter of 9 October 2003.)

TtEMI. 2004a. "Final Groundwater Sampling Summary Report for the Tidal Area Landfill (Site 1), Naval Weapons Station, Seal Beach Detachment, Concord, California." June 24.

TtEMI. 2004b. "Draft Final Sampling and Analysis Plan, Additional Groundwater Investigation at Tidal Area Landfill, Site 1, Naval Weapons Station, Seal Beach Detachment, Concord, California." December 21.